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ABSTRACT

This report presents a synoptic view of the research on the subject of new information technologies that has been supported by Unesco and of research conducted outside Unesco's program. The report attempts to single out the main findings of this body of research and to identify new avenues of investigation and action that may be able to contribute to the growth of the research effort. An interdisciplinary approach is taken to the main problem areas in new communication technologies, and the issues discussed range over the fields of economics, law, culture, sociology, and education. The report is divided into eight chapters: (1) Unesco's Activities in the Research Field; (2) Research on New Communication Technologies: The State of the Art; (3) The Explosion of Information Production (audiovisual communication, telematics, and computer networks); (4) The New Legal and Political Issues (legal and institutional dimensions, computer and video piracy, and the law and the concept of information); (5) The Cultural Issues Involved in the New Communication Technologies (cultural imperialism, emergence of new forms of culture, and cultural assimilation of new technologies; (6) The New Technologies in Education (media education, informatics and education, and new distance education technologies); (7) The Social Aspects of the New Technologies; and (8) The Interaction between Technology and Society. A two-part bibliography lists 45 Unesco studies on information technology, and a general section lists more than 250 items. A list of research and Comnet centers concludes the report. (DB)

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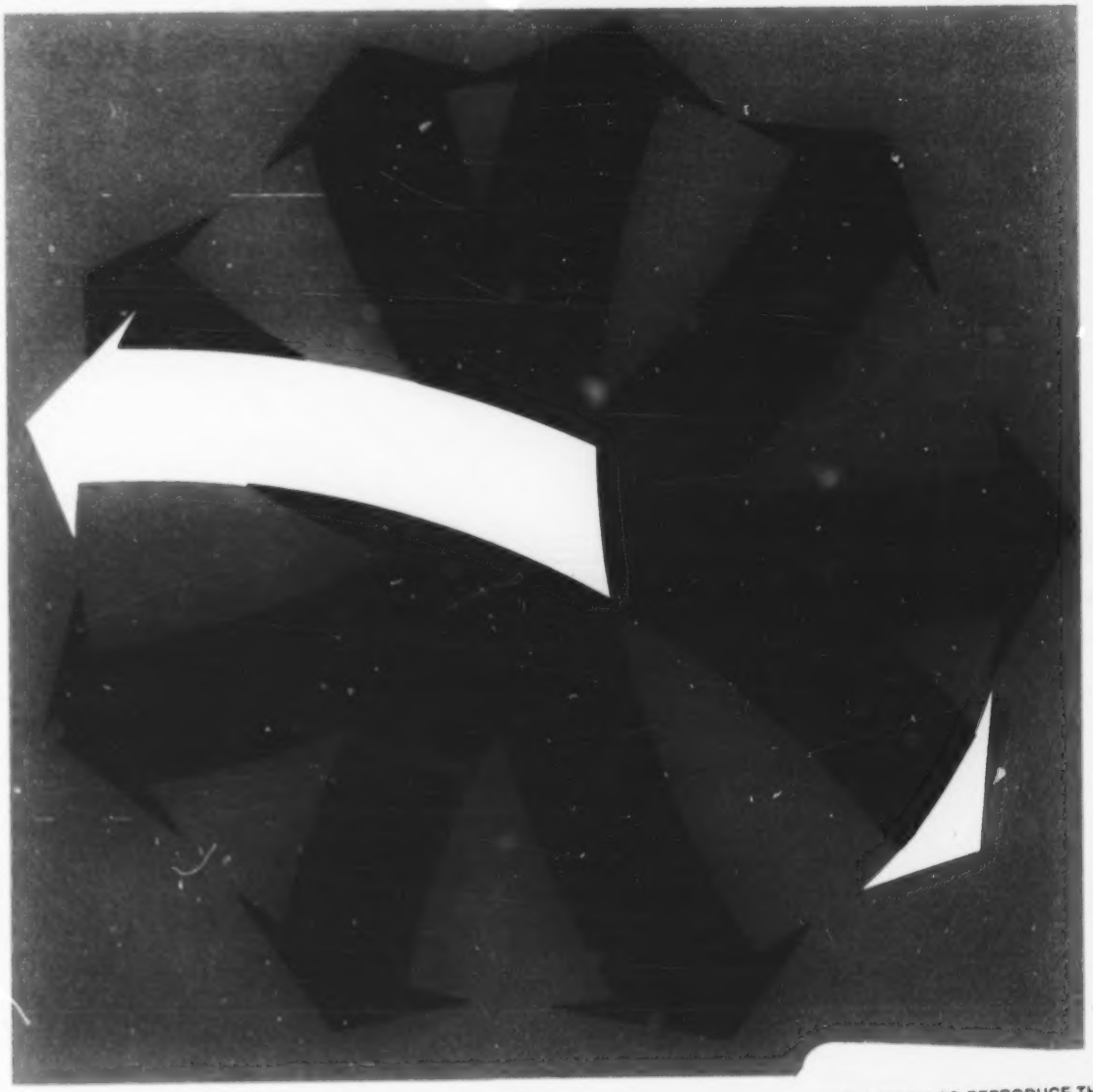

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New Communication Technologies: Research Trends

Josiane Jouët
Sylvie Coudray

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Preface

The dissemination of new information technologies is one of the topics of concern that featured in Unesco's Medium-Term Plan for 1984-1989. Indeed, the purpose of this document is to examine the main research issues raised in response to paragraph 03105 of the Approved Programme and Budget for 1984-1985 (document 22 C/5), which states:

> Particular emphasis will be placed, from the first biennium of the Medium-Term Plan onward, on studying the consequences of the rapid development of new communication technologies which is causing a genuine transformation of contemporary societies. The effects of these rapid changes on the social, economic and cultural aspects of the lives of individuals and communities must be understood so that they can be more effectively mastered. The work done during this period should make it possible to develop an interdisciplinary research programme in this area extending over the whole period of the Medium-Term Plan, to define ways of co-operating with the research institutions concerned, and to develop methods and research models to facilitate comparative analysis of results without disregarding cultural diversity.

This document accordingly sets out to present a synoptic view of the research activities supported by Unesco and of the research conducted outside Unesco's programme, which forms the bulk of the studies carried out on this subject. It attempts to single out the main findings of this research and to identify new avenues of investigation and action which may be able to contribute to the growth of the research effort.

The broad direction taken has been guided by the concern to adopt an interdisciplinary approach to the main problem areas involved in the new communication technologies. The issues discussed range over the fields of economics, law, culture, sociology and education. The scope of the exercise therefore rules out any claim to its being exhaustive. On the contrary, the aim is to engage in a general survey that will make it possible to grasp the across-the-board dimension of new communication technologies and their all-encompassing impact on the life of societies.

There can be no doubt that an overwhelming place is occupied by the research being done on the advanced industrial countries in which the new technologies are much more widespread. However, this document has also drawn inspiration from a small number of studies carried out in the developing countries, in a bid to examine more closely the ways in which they have applied these technologies. It has deliberately looked into the effects which the emergence of the new technologies has had on international communication.

This document was prepared by Josiane Jouët, a researcher at the French National Centre for Telecommunication Studies (Centre national d'études de télécommunications) and a member of the joint 'Communication' Research Group at the French National Centre for Scientific Research (CNRS), with the assistance of Sylvie Coudray, a Unesco consultant, who has reviewed Unesco's programme and compiled the bibliography.

The ideas and opinions expressed in this publication are those of the authors and do not necessarily represent the views of Unesco.

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Introduction

The 1980s ushered in the 'information society' and made their mark on the history of communication as the decade of technological upheaval. The explosion of information technologies is, in fact, at the root of a profound change which is spreading to the whole of social life. It is transforming all sectors of activity and is bringing about far-reaching mutations in the economic, social and cultural fields alike.

However, the technological advances made in recent years have not come out of thin air. They have to be seen against the background of the spectacular progress recorded in informatics, which has made it possible to miniaturize hardware and significantly cut back costs, and of the growing intertwining of informatics, telecommunications and the audio-visual media.

It is accordingly possible to speak of a 'digital revolution' which is reflected in the emergence not only of new materials and communication systems, but of new ways of doing things and the appearance of new contents. Technological innovation is now so prolific that it is virtually impossible to draw up an instant list of all the new tools of communication. However, in an endeavour to gauge their scope, it would not be altogether irrelevant to engage in a brief review of the major innovations that have come onto the market and have led to a break with traditional forms of communication.

In informatics, the micro-computer has made it possible to decentralize large systems, and its entry into business life and the home has enabled millions of people to have readier access to information technology. The amount of software of all kinds, whether it be for occupational, educational or entertainment purposes, has grown at an almost exponential rate. Moreover, management and data-processing procedures have made considerable progress, while the appearance of ROM compact discs points to the possibility of hitherto unprecedented data accessing and storage capacities.

Telecommunications have combined with informatics to produce countless innovations: signal digitalization, telematics, cellular radio, fibre optics and the emergence of wideband networks such as the Numeric Services Integration Network represent only some of the many examples of the progress made in telecommunications. Satellite transmission technology is developing to an equally marked degree, since the growing number of point-to-point satellites is stepping up the possibilities of long-distance communication, while the launching of direct satellite broadcasting is transforming traditional transmission patterns.

This progress is directly affecting the reception of audio-visual programmes and the traditional mass media are also going through other forms of change bound up with the technological revolution. Video recorders and cassettes have spread all over the world and are already no longer regarded as products of the new technologies. Cable television is making massive strides and is often enhanced by its interactive functions. Pay television is gradually gaining a foothold, while receivers are the subject of advanced research into such features as high-definition television, flat screens and so on. Programme manufacturing techniques are coming increasingly to integrate informatics with, for example, the introduction of electronic montage and synthetic images. The same developments are affecting the written media, right through from the entering of text on the word-processor keyboard to the computer-assisted 'desk-top' end-product. In short, the media system has been radically transformed through the emergence of new methods of production, transmission and reception.

The penetration of informatics into all sectors of communication is giving rise to considerable technological confusion and the dividing lines between technical systems are becoming increasingly blurred. On the threshold of the year 2000, technological advances are being made at top speed and the current progress is only the forerunner of even greater upheavals, what with the arrival, in the not so remote future, of fifth-generation computers, artificial intelligence, expert systems and natural language.

This rapid overview of the main innovations which have infiltrated the field of communication make it possible to pinpoint what we commonly understand by new technologies. Their novelty lies not so much in the broadening of the scope of the means of communication as in the appearance of a new technical content, through the integration of informatics, inter-active approaches, and so on, which caters for a different way of thinking. The technical principles behind these facilities are themselves instrumental in conferring an original and unprecedented value on them.

This paper does not set out to draw up a catalogue of all the new information technologies; its purpose is rather to

deal with the main innovations which have already had an impact in the fields of informatics and telecommunications, and especially the media. However, precautions have to be taken in handling the new technology concept. It has to be examined afresh against the yardstick of sociological criteria, for, although the validity of the concept defined in strictly technical terms is not called into question, it is still of only relative significance in many other respects. The fact is that some of the new technologies are proving to be only extensions of old technologies, which are being enhanced by new standards of performance. For example, telematics could be said to be no more than the extension of the capacities of the telephone, while inter-active television is introducing feedback from receiver to transmitter into technology based on vertical dissemination.

Furthermore, the novelty of a technical object can only be evaluated in a given social and economic context. In a large number of societies, however, traditional technologies are still considered as new, and television and the telephone, for example, are still looked upon as innovations. The developing countries are therefore finding themselves now having to contend with the twofold need to make up for their delay in installing traditional communication facilities and, at the same time, to enter the 'digital' era. Hence, on a worldwide scale, the concept of new technology is one that is highly relative and circumstantial.

In the case of research in the social sciences, the new technologies cover a particularly wide-ranging and varied field of investigation, since they impinge on all the processes of communication. The technological explosion gives rise to new research issues. The current upheavals can be identified in the economic, political, educational, social and cultural fields. These developments, which in some instances take the form of real mutations, are by nature complex and cut right across the spectrum. The changes taking place in one sector are accompanied by an almost immediate spinoff in other sectors, and the interdependence of the observed facts presents a real challenge when it comes to analysing them.

The question of the impact wielded by the new technologies is by its nature fundamental, since it touches on the transformations that are currently affecting all our societies. These transformations are particularly difficult to grasp since, as a result of the still recent emergence of these new technologies, their effects have often barely started to become perceptible and the dynamic behind them cannot yet be fully apprehended. In addition, the dissemination of the new communication tools ties in with a style of economic and commercial thinking that usually disregards the social parameters involved in adopting them and the deep-seated consequences they have for the workings of societies. Hence, research in the social sciences is seldom associated with the promotion of these new tools and is generally confined to observation of the *a posteriori* effects. Even so, this real-life situation ought not to reduce the role played by studies on the impact of the new technologies, since this is a prime requirement for measuring the dimensions of social change and for providing guidance for the political authorities and decision-makers. The findings of such studies represent a unique source of information for forecasting purposes, so as to enable the new technologies to act as a motive force in the harmonious development of nations.

The importance of these studies was recognized at a very early stage by Unesco, which made a point of encouraging the development of research on the impact of the new technologies from the mid-1970s onwards.

Indeed, the purpose of this document is to present a synoptic view of the work done by Unesco on this subject. It describes the general background to the research in which that international organization has engaged in a number of the world's regions and sets out the findings emerging from the studies undertaken. This exercise also traces in broad outline the large number of studies made outside Unesco's own programme, examines the main trends in the studies being developed at the international level and identifies the strong points and shortcomings of the research with a view to putting forward a number of recommendations for Unesco's future programmes.

Accordingly, the idea is to tackle the main research topics and issues raised by the impact of the new technologies through an interdisciplinary approach. This analysis makes it possible to single out the main trends in the studies undertaken, in an endeavour to pinpoint their shortcomings and explore fresh avenues of research. The scope of this work rules out any claim to the survey being exhaustive. There is no question of it being possible to draw up a complete picture of the research carried out in this area. On the contrary, the significance of this paper lies in the attempt which it makes to produce a synthesis of the issues developed, in order to present the main themes and areas of study covered by the research. The value of this document lies in the fact that it is meant to serve as a guide and its aim is less to engage in an assessment of the situation than to suggest a heuristic approach.

Chapter I

Unesco's activities in the research field

Communication represents one of the mandates entrusted to Unesco. Right from its creation, it has endeavoured to promote the role of communication in the growth of nations, the development of education, the advancement of culture, and international scientific and cultural exchanges. Unesco's action programmes have largely made use of the traditional media in performing that task, in parallel with support for research activities.

The recent arrival of new technologies on the communication market was immediately perceived by Unesco as being a decisive factor of change, and the need for research in this area was recognized in the First Medium-Term Plan for 1977-1982 (document 19 C/4 Approved, paragraph 9307). However, the importance of the new communication facilities and the urgent need for studies on their socio-cultural impact were given much more emphasis in the Second Medium-Term Plan for 1984-1989 (document 4 XC/4 Approved) and, in particular, in its paragraphs 3007 to 3011 and 3027 to 3031.

Programme III.1 entitled 'Studies on Communication' describes the overall context of Unesco's role as follows:

> The rapid development of communication technologies means that research is continually being renewed, and its findings constantly being challenged by the changes, not to say radical transformations, which these technologies bring about or are likely to bring about in different societies. Some research methods may be inadequate or ill-suited to contexts different from those of the societies in which they were devised. It is therefore important to promote studies on the socio-cultural, economic and legal aspects of communication, including future prospects, and to stimulate the development of a type of research which will be better adapted to different situations (para. 3027).
>
> Unesco's action could never supersede that of national or regional research institutions which, with their large research staffs and substantial financial resources, are able to carry out joint research on subjects of interest to the international community. By contrast, Unesco is in a specially favourable position to stimulate and co-ordinate such research and provide for widespread dissemination of the results (para. 3028).

The Second Medium-Term Plan therefore outlines the framework for Unesco's action which sets out, firstly, to stimulate and encourage studies and, secondly, to contribute to the dissemination of the work being carried out in the different regions of the world.

Before this programme was launched, consultations were held with the research bodies involved and, in December 1983, Unesco organized an international symposium in Rome on the cultural, social and economic impact of the new communication technologies.

The Rome Symposium

The purpose of the Symposium was to debate the issues raised by the new technologies, lay down priorities and prepare a plan and framework for appropriate research. These issues were consistent with the concerns of the Istituto della Enciclopedia Italiana which, through the Italian National Commission for Unesco, jointly organized the Symposium at its headquarters.

The Symposium brought together almost one hundred people, including 31 participants attending in their personal capacity, and 19 observers and representatives of four intergovernmental and 12 non-governmental organizations. The participation of researchers working in the communication field, media professionals, engineers and technologists, creative workers and decision-makers made it possible to obtain an extremely wide range of opinions encompassing all the issues raised by the effects of the new media.

The discussions were launched on the basis of an annotated agenda and of the replies received to a brief letter of enquiry which Unesco had addressed to 378 institutions in different parts of the world with a professional or research interest in communication. This letter of enquiry asked for information on on-going research and on prospective research projects. The replies of the 61 institutions that were able to meet the short deadline set by Unesco all concurred on the need for developing research in this area.

The Symposium's work was divided between the plenary sessions, in which the discussions were supported by the presentation of papers covering different aspects of the impact of the new communication technologies, and the meetings of two working groups, which addressed them-

selves to classifying the research issues arising in the different sectors of communicational activity.

The plenary sessions afforded an opportunity for exploring the general thinking on the role of the new technologies. This was seen as being largely ambivalent, with the positive and negative effects offsetting one another. Stress was laid on the fundamentally innovative dimension of the new technologies which, as a result of their across-the-board impact, give rise to a host of problems and questions which affect both the physical dimensions and value systems of our societies and the tangible applications in all sectors of activity. This 'universal' scope of modern communication, as it were, presents a real challenge to researchers who are having to contend with a radically new situation.

Of the two working groups, one focused on research in the socioeconomic field and the other on research into the cultural and educational aspects. These groups put forward a set of recommendations covering a large number of fields of study. It is not the purpose of this document to describe all the subjects mentioned, but rather to give an overview singling out the main lines of thrust that should be adopted by research.

Questions regarding the public interest

The themes raised by the experts covered a variety of points, including the definition of what is understood by public interest, the spelling-out of social need in new technologies, the question of access to and participation in the new media, the democratization of communication systems, the specific needs of minority groups, and the means of control used to guard against adverse effects and ensure the egalitarian and democratic development of the new technologies.

Socio-cultural questions

The questions raised covered the evolution of existing communication institutions as they have to contend with the penetration of the new technologies (the processes involved in dismantling them or in their deregulation and re-organization, etc.). The impact on information flows between urban and rural areas, as well as between post-industrial and developing nations, was also raised. In fact, the modification of the existing structures upsets the *status quo* and foreshadows processes for striking a new balance between institutions at the national, regional and international levels. It also calls into question the future role which will be assigned to information in its twofold function as a marketable commodity and a social service.

Development

In this area, the themes hinged on the problems bound up with the potential role of the new technologies in the development process (literacy, education, health, agriculture, etc.). The question of helping the developing countries to achieve self-sufficiency is as crucial as that of reducing the gap between rich and poor countries. It has to be asked whether the new communication technologies can act as catalysts in development.

Economic questions

The possible role of the new technologies in surmounting the economic crisis worldwide was recognized as being an important subject for study. The problems are centred on the effects which the introduction of the new facilities would have on production systems and point to the need to undertake research on the evolution of world economic structures and cost-benefit studies drawing comparisons between the old and new technologies, on the one hand, and between socialist and market-economy countries, as well as between developing and industrialized countries, on the other.

Technology and the media

The problems tackled by the experts related to the specific technical features of the new communication technologies, as these pertain to the increase in their number and to their obsolescence and vulnerability. Does technological complexity mean that workers in the social sciences will have to acquire new technical skills? Will the new technological capabilities make it mandatory to draw up new legislation to protect individual privacy and national security? Will the impact on the transfrontier circulation of data call for new regulations?

Cultural identity and cultural policy

The participants looked into the potential role of the new technologies in strengthening cultural identity and understanding between cultures and in preserving minority cultures. The link between miniaturization and the reduced cost of hardware, on the one hand, and the democratization of culture, on the other, was seen as being a subject for study. The impact of transfrontier communication on local identity is a priority research question, as is the threat it represents for the preservation of living culture.

Cultural industries and professions

The questions arising under this heading were centred on the growth of the communication market, which is being transformed as a result of an abundant source of supply and an increasing demand for information and entertainment programmes. The restructuring of the communication industries is having an influence on the relevant occupations (computerization, the emergence of new qualifications, etc.). The publishing and library services sector is also having to contend with the integration of the new technologies. In addition, it has to be seen how institutions devoted to the performing arts react to the introduction of new artistic processes and how local performers adapt to the overwhelming

production of forms of entertainment promoted through the media. The experts also regarded the impact of transborder communication on public taste and demand as being a crucial problem.

Cultural traditions and language

The storage and accessing capacities of the new technologies are likely to improve methods for preserving and transmitting technical and cultural documents. The participants saw the question as being posed in terms of the constraints entailed by the use of such technologies for safeguarding the world cultural heritage. In addition, it is necessary to study the relationship between the use of the new technologies and the development of a mother tongue and a national language policy. It has to be asked what impact the new technologies will have on the functions of oral traditions and language performance in general.

Educational structures

The integration of the new technologies into formal and non-formal educational structures is a source of many questions. What will be their effects on educational institutions, curriculum contents and job learning? Can the new training tools contribute to the generalization of primary education and to the eradication of illiteracy? The adaptation of instructional software to the different socio-economic and cultural contexts is a fundamental issue and calls for an evaluation of transfers of educational technology.

Cognitive development

The relationship between new educational methods, such as computer-assisted instruction, and the individualization and decentralization of teaching should be more closely ascertained. Are differences in access and exposure to the new technologies likely to noticeably increase differences in knowledge and aptitudes between individuals? In addition, the experts examined the wide-ranging question of the cognitive and related long-term effects of informatics on human behaviour, the evaluation of which is giving rise to serious problems of evaluation.

This overview of the subjects of study identified by the participants in the Rome Symposium is valuable as a demonstration. It illustrates both the scope of the area of research raised by the new technologies and the concern for striking a balance between theory and tangible applications, as well as between comprehensive studies and closely circumscribed research. The assembled experts acknowledged that research is never neutral and that the growing number and variety of studies carried out by differing research centres was a guarantee ensuring that knowledge would be broadened and deepened.

The Rome Symposium noted that research on the socio-cultural impact of the new technologies was affected by a lack of financial resources, poor dissemination of the research findings, and methodological difficulties.

The Symposium's recommendations addressed the need to develop research through a multidisciplinary approach that should be both holistic and contextual. Stress was laid on the role Unesco could play in the promotion of research; it was defined as being complementary to the activities of the national research centres. It was recommended that, in view of the specific nature of Unesco's international terms of reference, it should intervene by:

supporting comparative studies on an international scale;

compiling an inventory of research carried out in the different regions of the world;

establishing links between the different research programmes and encouraging the sharing of information between researchers engaged in the study of the socio-cultural impact of the new technologies.

The definition of this policy for facilitating and disseminating research at the international level was followed up by the dispatch of a letter to more than 1,000 professional and research institutions and organizations throughout the world, enquiring about their research activities on the socio-economic and cultural impact of the new technologies and the possibility of their being interested in co-operating in a joint research programme with Unesco. At the end of September 1984, 287 organizations had replied to this letter and 216 of them had intimated their intention to participate in a preparatory meeting. As a result, it was decided to organize consultations at the regional level, in order to associate researchers from different parts of the world in the implementation of the programme.

Regional consultations

Three meetings were held for the purpose of ascertaining the research problems and priorities specific to the different regions of the world. The common objectives of these meetings were to:

consider the trends in research on the socio-cultural impact of the new technologies in the individual regions;

set up machinery for collecting and exchanging information on the studies undertaken;

discuss the mounting of a joint research programme based on the launching of comparative studies on specific subjects;

draw up a framework and working methods for carrying out the research programme.

The Florida consultation (December 1984)

This meeting covered the area of research for the regions of North America, the Caribbean and Latin America. It was held at Florida State University in Tallahassee, United States, and was attended by 38 university teachers divided into two working groups.

In the group on 'exchanges in communication research', it soon emerged that the concerns of the researchers differed significantly, depending on the level of development of the societies they were studying. The Latin American researchers

indicated that they needed to obtain statistical data, but they also stressed that the findings of the research carried out in North America was unsuited to their region, since it was too specialized in the new technologies. Moreover, shortcomings were noted in the exchange of information between researchers, and the lack of information was particularly felt in the countries of the South.

The group's recommendations were mainly concerned with the dissemination of information on completed or ongoing studies, a sector in respect of which it was requested that the role of the International Network of Documentation Centres on Communication Research and Policies be strengthened. It was also felt necessary to request Unesco's assistance in drawing up directories of researchers concerned by this type of study, complete with an indication of their field of specialization.

The working group responsible for examining the possibilities of joint research underscored the importance of engaging in comparative studies through the harmonization of issues and methodologies. The participants identified a number of research themes in which the priorities hinged on the following issues: the uses of micro-computers and video, the effects of the new technologies on public involvement and cultural identity, the problems connected with technology transfers and public policies, the role of smallscale media and the traditional mass media in respect of the arrival on the market of the new technologies, and the use of the research findings. In short, three main categories of studies emerged as requiring work at the regional level. These were communication policies, the question of the transfer and adaptation of new technologies and that of their use and their impact on society at large, i.e. on education, cultural identity, ways of life, etc.

The Ahmedabad consultation (December 1989)

This meeting covered a vast regional area, including Asia and the Pacific, Africa and the Arab States. Some 38 participants were welcomed by the Development and Educational Communication Unit (DECU) at the Space Applications Centre of the Indian Space Research Organization (ISRO) in Ahmedabad, India.

The discussions were prefaced by a paper on the state of research in different countries, which showed that there were marked disparities in terms of both the volume of studies and themes, and a chronic lack of information exchanges between researchers.

The assembled experts drew up a joint research programme which was structured around the main lines of thrust corresponding to the two working groups.

In the field of communication policy and planning, the research suggested related to the following questions:

communication management covering studies on structures, legal mechanisms and organizational linkages;

the social impact of specific technologies such as direct satellite broadcasting, computers, cable television, video and natural disaster warning systems;

communication and culture in terms of their historical, ideological and political dimensions, as approached from the standpoint of the interrelationships between them.

The working group covering the sector relating to the applications and social consequences of the new technologies identified the following research priorities:

access to the new communication technologies, including the study of the participation factors and social differentiations which can be identified between the sexes, between urban and rural areas and between regions;

conceptual and theoretical studies entailing re-examination of the traditional issues in communication research and a definition of new conceptual frameworks;

applied studies on specific technologies such as teleconferencing, office automation, data systems for planning purposes and, more generally, the political economy of the new communication technologies.

The participants also called on Unesco to develop documentation and the exchange of information between research institutions. They suggested the creation of a liaison bulletin allowing the regular dissemination of information on research and the organization of seminars for setting up effective machinery for the dissemination of information. It was also recommended that the Comnet network be extended and be provided with greater facilities for performing its task.

The Göteborg consultation (January 1986)

This meeting was organized by the University of Göteborg in Sweden and was the most widely attended, in that it brought together 77 participants from the countries of both Eastern and Western Europe engaging in a variety of communication research disciplines (sociology, political sciences, economics, history and philosophy) and occupational sectors (journalism and communication systems management).

The discussions in the three working groups were prefaced by papers on the state of the art in different European countries, which demonstrated the wide variety of studies carried out in terms of both subjects and methodologies.

The working group on technology policy and planning voiced its concern for developing research more closely geared to public needs in order to offset the predominance of market and technological evaluation studies. It also called for the organization of a symposium on media ownership in Europe. A number of proposals for research were also put forward on the following themes:

the funding of local and regional media in different European countries;

communication satellite policies in Europe, including consideration of the economic and legal factors and those pertaining to national sovereignty;

the introduction into Europe of the Integrated Services Digital Network, including the study of the national and international planning of that network, its professional and domestic applications, its military interest and the different risks it involves, such as social control.

The working group on the socio-cultural applications and effects of the new technologies put forward proposals for research in the following areas:

the uses made of the media by different age-classes; the aim here was to ascertain the uses made of the new technologies both by young people (differentiation of uses according to the sexes, impact on personality development) and by the elderly (potential role of the new media in adjusting their way of life and in ensuring their social integration);

the occupational sector, covering studies on the communication professions (transformation of qualifications, evolution of forms of work, etc.), the cultural professions and artists (new markets for culture and their effects on work) and, more generally, the other occupations affected by the introduction of the new technologies (the impact on working conditions and on job performance);

unemployment perceived through the negative and positive effects of the new technologies on unemployment and the potential role of the media in helping the jobless;

rural problems, including studies on access to the new technologies and on their consequences for the rural population.

This group also suggested the creation of a European media indicator system, which would include the compilation of statistical data on both the old and new media. These data would be integrated into a computerized data bank, possibly giving rise to the production of a European Media Atlas, which would be periodically updated.

The working group on documentation and information exchange recommended that the following steps be taken:

compilation of a European directory of communication researchers;

establishment of an inventory of European periodicals on mass communication and communication technology, including a survey of scientific journals and liaison bulletins, together with a list of the 'grey material' produced in this field by the European organizations, for example;

creation of an electronic data network for communication researchers.

The participants stressed the importance of conducting studies on the effects of the new technologies on the transfer and exchange of information, and on the difficulties raised by international standardization of documentary procedures. The development of co-operation between public and private institutions was also considered desirable. It was likewise recommended that the Comnet network be broadened to cover all the European countries and that Unesco's Mass Communication Thesaurus be revised, so that it would better identify the new technologies.

These three regional consultations organized by Unesco made it possible to learn about the difficulties encountered by research in the different parts of the world and to decide on the priorities for studies. The broad consensus was that research was scattered, information was lacking not only on the research carried out in other regions of the world but also on that being done in neighbouring countries, and there were virtually no comparative studies. The participants in these consultations accordingly called on Unesco to play a role in ensuring international co-ordination and the multilateral dissemination of information. These recommendations served as guidelines for the more precise definition of Unesco's programme on the new technologies, which was drawn up at the same time as these consultations were taking place.

Unesco's programme

Unesco's support for the promotion of research on the socio-cultural impact of the new technologies took on tangible shape in the biennial Programmes and Budgets corresponding to the implementation of the Medium-Term Plan for 1984-1989.

The Programme and Budget for 1984-1985 (document 22 C/5 Approved) states:

> A research programme will be developed on the impact of the accelerated growth of communication technology on societies and cultures, including inter alia its consequences for creative workers and artists. This research programme, which will cover the period of the Second Medium-Term Plan, should also make it possible to clarify the significance and study the conceptual basis of the 'information society', which already typifies the present situation in certain societies (para. 03110).

The impact of technology embraces a concern that cuts right across Unesco's mission and this issue impinges on a large part of the Organization's programmes and is cited on several occasions in the Programme and Budget for 1984-1985. It is mentioned in the following programmes : 'Education for all', 'Formulation and application of education policies', 'Education, training and society', 'The sciences and their application to development', 'Information systems and access to knowledge', 'Principles, methods and strategies of action for development', 'Science, technology and society', and 'Culture and the future'.

Some aspects of these programmes should be noted. For example, in the Education Sector: 'Stock will be taken of trends and prospects in regard to the application of data processing and the use of computers in education, in association with activities under other relevant Programmes and Subprogrammes... (para. 04245). In the Culture Sector: 'Support will be provided for the development and co-ordination of a programme of interdisciplinary future-oriented studies on the impact of new technologies on culture and cultural identity in the industrialized countries...' (para. 11262). In the General Activities Sector: 'Studies will be carried out on the various solutions ... concerning procedures for the application of the provisions ... that would solve the copyright problems raised by the new techniques of reproduction and dissemination...' (para. 15136).

The Programme and Budget for 1986-1987 (document 23 C/5 Approved) lays stress on the stimulation of research through the following Programme Actions:

> Intellectual and financial contribution to carrying out 30 comparative studies on the socio-cultural impact of new communication technologies, taking note of problems involving copyright and other questions of an economic or legal nature which may be relevant to Unesco's work within its areas of competence, in Latin America and the Caribbean, in Europe, in Africa, in the Arab States, in Asia and the Pacific... Collection, collation and half-yearly

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distribution of basic documentation and also of the conclusions of the research carried out in all regions of the world on the socio-cultural impact of new communication technologies (para. 03105).

Increase and systemization of exchanges between research and documentation institutions in the field of communication, including the automatization and development of the Comnet network, which should include, by the end of the biennium, at least one additional regional centre and two national centres; revision of documentation standards so as to include in the Thesaurus on Mass Communication descriptors corresponding to the new forms and technologies of communication (para. 03104).

Identification and evaluation, at the national, regional and international levels, of needs and resources in the area of communication development, in particular by the constitution of a data base and the publication of a periodic report on the state of communication throughout the world (para. 03304).

The Programme and Budget for 1988-1989 (document 24 C/5 Approved) provides for the continuation and completion of the work defined in the Medium-Term Plan (paras. 03104 and 03106).

Owing to the budget cutbacks connected with the withdrawal from the Organization of the United States of America and the United Kingdom, it has not been possible to implement the whole of the projected programme. Even so, Unesco has engaged in a series of activities in support of research.

Assistance for research

Some studies have been carried out in different regions of the world on the applications of new technologies and on the legal, economic and sociocultural problems raised by those technologies (see the list of these studies in the Annex).

These studies, which have been carried out by national or regional research facilities, differ from the earlier comparative research undertaken by Unesco, which was carried out on the basis of a common set of problems and methodology. In this instance, Unesco has not performed the same role in organizing and supervising the studies and has given prominence instead to activities aimed at encouraging and catalysing studies likely to furnish comparative data.

A review of the existing work has also been carried out on the basis of several inventories compiled on research undertaken on various continents. These regional inventories contain lists of the completed or ongoing studies presented, as well as a summary specifying the research themes, the methodology used and the main findings. These annotated synopses have been produced for Latin America, the Arab States, Asia and the Pacific, Africa and the countries of Eastern and Western Europe.

Two conferences were also held in Europe and made it possible to assess respectively the status of the Integrated Services Digital Network and the possibility of launching comparative studies between different European countries.

Exchanges of information

Unesco has participated in the setting-up of an information network for the Latin America region, following the recommendation made at the Florida consultation, which had stressed Latin American researchers' chronic shortage of information on studies dealing with new technologies and the difficulties of communication between the different research centres throughout the region. This network has taken shape through the publication of an NTC/NCT liaison bulletin providing information on ongoing research, communication policies and projects, scientific events and bibliographical references. This bulletin, financed with Unesco's assistance and compiled by the Study Centre on Transnational Culture of IPAL (Planning Institute for Latin America), in Lima, was produced and distributed on a regular basis from 1986 to 1988, but was thereafter no longer published, owing to financing difficulties. It is planned to start producing it again in the near future.

A directory on communication research in the countries of Western Europe has also been produced by the Institut pour le Développement de l'Audiovisuel et des Télécommunications in Europe (IDATE), with the support of Unesco and the European Community. It covers 200 public and private institutions participating in communication research and contains a list of 400 researchers and consultants whose areas of research are specified. This computerized data base, which goes by the name of 'Arcome' and is accessible on-line on the European Community's Echo server network, also contains a list of 2,000 publications that have appeared since 1980. This directory is also available in a two-volume printed format, one for institutions and the other for researchers. The purpose of the data base is to facilitate exchanges of information between European researchers.

Documentation

The International Network of Documentation Centres on Communication Research and Policies (Comnet) has been improved in accordance with the Approved Programme and Budget for 1986-1987 (para. 03104).

A meeting of the members of Comnet was held in Singapore in June 1987; a critical evaluation was made of the network and tangible decisions were taken with a view to facilitating its extension and efficient operation.

The revision of the Thesaurus has made for improved international standardization of bibliographical procedures and the inclusion of new descriptors adapted to the new communication technologies. This work will be completed in 1990.

The project for the standardized automatization of the network is still proceeding and is expected to take tangible shape in the light of the findings of the feasibility study undertaken for that purpose.

Chapter II

Research on new communication technologies: the state of the art

The arrival of the new technologies has caused communication research to evolve in a variety of ways. It is true that this has provided an opportunity for developing new themes and areas of study, but it has also led to questioning the issues involved at both the theoretical and methodological levels. The whole field of research on new technologies currently appears to be quite devoid of any structure and it brings together a mixed bag of studies coming within a varied range of problem areas.

Researchers in this field have to contend with specific problems which limit their scope for action and do not enable the research to reply fully at this stage to the urgent questions raised by the dissemination of new communication technologies.

The difficulties faced by research

Researchers studying the new communication technologies are faced with various kinds of scientific, policy and material problems.

At the scientific level, the new technologies are instrumental in calling into question the traditional research disciplines. The fact is that the growing complexity of communication systems and the impact that the new technologies have on a whole range of sectors are drastically changing the areas of study. The increasing interfacing between audiovisual media, informatics and telecommunications is giving rise to considerable technological disarray and makes it difficult to define the subjects of study and trace the line of demarcation between the empirical fields. At the international level, the development of non-material information flows extending beyond national borders is becoming increasingly difficult to subject to statistical evaluation, which is having to cope with imprecise sets of constantly shifting data. In addition, the socio-cultural repercussions of the new technologies, which affect the areas of culture, leisure, education and work alike, are blurring the traditional dividing lines between specific areas of activity and posing serious theoretical and methodological problems for researchers.

The new situation in the field of communication is also compounding the difficulties involved in comparative studies. The installation of new technologies varies significantly from country to country and their impact differs with the cultural environment in which they are installed. As a result, the definition of joint projects on the basis of broadly the same themes and methodologies for studies that can be carried out in parallel in different countries becomes a very complex exercise.

The question also arises of the effect that researchers can have on communication policies. Forecasting in the area covered by new technologies is an extremely difficult task in which allowance has to be made for a whole range of parameters, some of which cannot be easily quantified. Consequently, the demands of policy decision-makers wishing to obtain ready and reliable data for forecasting purposes are often unrealistic. The dialogue between the scientific community and policy decision-makers therefore often remains embryonic, with the researchers generally working in the ivory tower of their laboratories, while the policy-makers blithely hope to control the scope and effects of the dissemination of the new technologies. The findings of scientific studies generally suffer from the fact that they are not very widely circulated and seldom reach as far as the spheres of power.

The community of communication science researchers seems to be powerless in the face of the host of new technologies requiring a significant increase in the number of studies. Firstly, there are not so many researchers, even in the industrialized countries, and they are often spread out and isolated in universities or multi-purpose research centres. Secondly, decision-makers and the promotors of those technologies give preference to market surveys and evaluations that are carried out by private consultants and are designed to provide operational results for their commercial policies. Interest in the real needs of the public and the sociocultural effects of the new technologies are not regarded as being a priority, and research of the academic type, which raises more general and fundamental issues, usually lives off the meagre credits allocated by public bodies.

Lack of resources is therefore a feature of research on the sociocultural impact of the new media, and the economic and commercial dimension enjoys the benefit of more funding than issues of a social character. The inadequacy of funds for research is compounded by other material problems, among which documentation occupies a prominent place.

Problems of information accessing and circulation

Communication researchers have to contend with a variety of difficulties connected with documentation, ranging from a lack of material to its superabundance. The situation in the developing countries is notable either for the lack of national documentation facilities or for the inadequate amount of material on communication available in national documentation centres. In the industrialized countries, there are usually abundant documentary sources, but these are frequently scattered. Only some of the documentation centres are computerized, often on non-standardized data-processing systems, and this presents researchers with documentation accessing and management problems. Moreover, information on the bibliographical references of other countries is generally unsatisfactory, making it difficult to learn about the research carried out in the region or other parts of the world.

The documentation needs of researchers are many and varied and range over bibliographical references, ongoing or projected research subjects and methods, scientific seminars or conferences, documentation centres, data banks and automatic data-processing software.

As the situation stands at present, only the Comnet network is endeavouring to remedy the shortcomings of the regional and international exchange of documentary information. This network, which was created in 1969, is an informal supranational system for exchanging information and is based on the voluntary membership of documentation centres. Most of these are regional centres such as Nordicom (comprising the Nordic countries), Arabcom (some of the Arab States), Carimac (the countries of the Caribbean), Cecom (the countries of Eastern Europe), Ciespal (Latin America), Amic (Asia), Cesti (French-speaking Africa) and ACCE (English-speaking Africa). However, a number of national centres are also members of Comnet, including Admac (Austria), Bibliocom/Badicom (Canada), CMCR (United Kingdom), Ibercom (Spain), IFP (France) and Isiss (Soviet Union). Unesco's Communication Documentation Centre (CDC) also forms part of the network and the Organization plays a key role in supporting Comnet. Other documentation centres have intimated that they are interested in joining the network. Even so, there are still vast geographical areas that are not covered by Comnet, including the United States of America, the Federal Republic of Germany, Japan, China and Australia.

Comnet provides a flexible and decentralized infrastructure which is still by no means fully operational. The efficient functioning of the network is burdened by the recurrent lack of funds and by other constraints bound up with structural and cultural factors. Comnet's member centres vary significantly in size: some of them have a vast stock of communication documentation managed by specialists on the subject, while others still have only very few documents and limited manpower. Moreover, owing to the wide variety of indexing and bibliographical analysis procedures used, there is considerable discrepancy between references. Language problems and the differing interests of the people using the individual centres make it difficult to harmonize the structures and forms of documentation. The lack of funds also inhibits the exchange of information and documents between the centres and such exchanges cannot therefore be put on a systematic basis.

All these factors account for the obstacles hampering the coordination of the network, which would require the creation of a bulletin to ensure liaison between the centres and the setting-up of a more formal system of co-ordination, and even a permanent secretariat, in order to ensure compliance with the principles enshrined in Comnet and the standardization of documentary rules.

Unesco has made use of its Regular Programme and of extra-budgetary funds to finance the revision of the Comnet Thesaurus, based on the Organization's Thesaurus on Mass Communication, which is now out-of-date. In early 1987, a questionnaire was sent out to all Comnet's members seeking their suggestions on the standardization of references and indexing procedures and on the addition of descriptors specific to the new technologies. This work was carried out with the assistance of the International Federation for Information and Documentation and, as already stated, is now in the course of completion. The adoption of this new Thesaurus should make it possible to create a common language between the documentation centres and facilitate the use of the information exchanged.

The automation of Comnet is another priority aimed at affording direct access to the data banks of the individual centres. Computerization of some centres is already at an advanced stage, but the widening inequalities between the facilities of the different centres and the need for subsequent harmonization of the data-processing systems to ensure compatibility of the documentation management hardware and software, standardization of accessing procedures, etc., are giving rise to problems. The findings of the feasibility study carried out by Services Documentaires Multimedia Inc. is expected to result in computerization of the network. This appears to be the most appropriate solution to remedy the shortcomings involved in the exchange of information and in making the network operational.

In addition, the publication, in 1989, of the *World Communication Report* has proved to be of invaluable assistance to researchers. This voluminous document, which is an initiative of Unesco's International Programme for the Development of Communication (IPDC), is primarily intended to be a comprehensive reference tool for communication policy-makers, planners, managers and practitioners.

This publication, on which 44 specialist collaborators, 20 National Commissions for Unesco and 119 international and regional organizations collaborated, represents a unique exercise in the compilation of information on the field of communication. It presents a vast panorama of the communication situation throughout the world and brings together a mass of hitherto unpublished data, in particular on the developing countries.

The descriptive and statistical data assembled in the report represents an invaluable guide for communication researchers. In fact, the last two chapters of the *Report* cater directly for such researchers' concerns.

The chapter on reference information, research and documentation provides a list of the main research institu-

tions and organizations at the regional and international levels and a selected list of scientific periodicals and reference books, together with a subject bibliography.

The chapter on communication statistics brings together precise data for each country in the following sectors: printed materials (newspapers, periodicals and books), libraries, motion pictures (film production, import and export of films and cinema attendance), radio and television (production by types of programme, transmission facilities and the number of receivers, data on radio and television institutions (types of ownership and funding and the categories of personnel employed), postal and telegraphic services (the number of post offices and telegram services) and telecommunications (facilities and telephone traffic, telex services, data transmission, communication satellites, and incomes and expenditures in telecommunication services). In addition, intersectoral data are provided on the trade balance, advertising income, and the import and export of communication equipment and programmes. Certain statistics are not available for some of the developing countries. All the statistics have been checked, although this obviously does not rule out some margin of error owing to local data-collection methods. On the whole, however, the volume of data provides a good basis for analysing the communication situation and the interregional balances and imbalances. The effort that has been accomplished in bringing all these detailed international statistics together makes the *Report* an essential reference guide for researchers.

The other seven chapters also offer significant sources of information for research. The sectors covered by these chapters are 'Communication and development co-operation' (international, regional and bilateral co-operation); 'Communication technology', tracing the evolution of the new means of communication and their applications in various countries; 'Economic and industrial patterns', covering the questions of media ownership and funding, market economies and efforts at regional co-operation; 'Employment and training'; 'Information flow', dealing with the broadcasting and circulation of news, television programmes, films and video cassettes, music records and cassettes and data flows; 'Developments in regulation', a chapter dealing with different regulatory instruments in such sectors as the freedom of information, the protection of intellectual property, telecommunications, informatics and individual security; 'New communication approaches and audiences' on alternatives to mainstream media (community media, etc.), women in communication (portrayal of women in media content, employment of women in the media, alternative women's media), as well as on media education and youth.

It is true that initiatives based on international partnership are encouraging, but the efforts being made are still not sufficient to overcome the shortcomings in documentation, especially in the developing countries. Yet those countries are now having to contend with the problems of technology transfers and they need, as a matter of priority, both technical and more general information on the ways in which the technologies are being used and the impact they are having.

The varied range of research issues

Communication research has always been multidisciplinary by nature. As a rule, the studies come under the heading of a main discipline, which may be economics, politics, law, sociology, education, psychology, etc. Research on new technologies is no exception to this distinction between fields. It also takes its lead from the main theoretical frameworks evolved by mass communication research and hence the work being done at the present time often bears some relationship, however loosely-knit, to either empirical or critical currents.

At the theoretical level, however, research on the new technologies is not confined to the mere reproduction of past models. In fact, the current situation is characterized by an eclectic variety of theoretical lines of approach that reflect a climate of intellectual agitation and the search for new conceptual frameworks for thinking about and interpreting communication processes. The introduction of interactivity into communication systems has, in fact, upset the linear scheme of things stretching right through from production to reception. The new technologies are dismantling the frontiers between mass communication and individual communication. The new communication supply is altering the terms of the market both domestically and internationally. The institutional and legal frameworks are giving way to new forms of regulating communication systems. This development is compelling researchers to re-examine the old paradigms.

At the methodological level, the habitual distinction between quantitative and qualitative studies is still valid for research on the new technologies. Alongside quantitative surveys which attempt to measure their economic or social spin-off, there can be seen to be renewed interest in studies involving qualitative methods. Since the practices of the new media are not yet well-defined or are still being developed, qualitative approaches make it possible to observe more closely the mechanisms by which these new tools are adopted, the ways they are used and the impact they wield. Quantitative and qualitative techniques are therefore sometimes combined in research projects on new technologies.

A review of the research situation in the world's different regions reveals significant disparities. Research on new technologies appears to have moved off to a good start in the industrialized countries, which benefit from a greater volume of resources in terms of personnel and research credits, while the developing countries are affected by the weakness of their research facilities and are, moreover, less concerned by the new technologies because they are less widespread.

The regional inventories on completed or ongoing studies compiled at Unesco's request make it possible to draw up an overall picture of the state of research in the world. It is true that these inventories, which comprise a list of studies complete with comments, cannot be exhaustive but, in spite of the limitations inherent in an exercise of this kind, they do provide some pointers to the broad trends and to the nature of the work being done in the world's different regions.

In Latin America, research suffers from a lack of funding, which has led to the interruption of a large number of study projects. Out of the 40 studies listed, more than half are

being carried out by Brazil followed, for the rest, by Argentina, Venezuela, Chile and Mexico. The problem areas covered are chiefly concerned with the impact of new technologies in industry and the effects of computerization on working conditions. There are few studies on the social and cultural problems raised by the new technologies. In the Caribbean, the few studies carried out primarily deal with the situation of the media and communication policies.

Research in Asia seems to be better provided for. The themes tackled are varied, and relate both to the mass media and to the new technologies, especially communication satellites, computerization and the impact on employment. However, a large number of the studies are of a sectoral nature and cover very limited fields, and they often take the form of masters' or doctoral theses. The region is also having to contend with a lack of funds and the report to Unesco mentions that only two studies were able to benefit from sufficient credits to undertake large-scale research. These are on the introduction of national television in Indonesia via the Palapa satellite and the socio-economic impact of the rural telephone service in Thailand.

In the Arab States interest is focused, as a matter of priority, on the cultural spin-off of the new technologies. Researchers are primarily concerned about the impact of fiction programmes broadcast by satellite or viewed on video-cassette on traditional ways of life and values.

In the countries of Eastern Europe, research has developed to differing degrees. The introduction of new technologies in communication agencies and their impact on the work of professionals is one subject of study. Empirical work is also being done on the development of video, as well as on cable and satellite television and on the uses of micro-informatics. Research on new technologies is being given growing attention in Hungary, Czechoslovakia and Yugoslavia in particular.

The countries of Western Europe have the largest number of studies, and these cover a variety of problem areas and subjects. The research situation varies from country to country but, on the whole, the emphasis placed on the technical dimensions and on the economic and legal impact of the new technologies appears to be given preference over research devoted to their social and cultural effects, which is less attractive a subject, especially to private funding agencies. However, the importance of such evaluation and market studies does not prevent broader scientific questions from being asked about the ways in which the new technologies are spreading in these countries and the repercussions they are having.

The new technologies have also provided several European countries with opportunities to embark on national study programmes, which have brought together researchers scattered in individual research centres or universities. Among these ventures, mention should be made of the Programme on Information and Communication Technologies (PICT) in the United Kingdom, the Dutch and Finnish research programmes devoted to the social implications of information technology, the programme in the Federal Republic of Germany on the social acceptance of technological developments, the 'Communication' research group in France, and the Foundation for the Development of the Social Function of Communications — Fundesco — in Spain. In addition, the European Institute for the Media, in Manchester, and IDATE, in Montpellier, are engaging in a wide range of research on new communication technologies in Europe.

Co-operation between European researchers has also started through common publications, such as those on electronic media and communication policies in Europe produced by the Euromedia Research Group. For example, European working groups have been set up on the Integrated Services Digital Network, with Unesco's assistance. A number of comparative studies have also been undertaken at the instigation of research centres in various European countries, such as the Eurocommunication Recherches group, which is looking into the evolution of communication systems. In addition, the European Community's support can be seen from its Forecasting and Assessment of Science and Technology programme (FAST), which is funding research on various aspects of the new technologies, including a major project dealing with their future impact on the media industry in ten countries of the Community.

As a result of the growing transnationalization of communication systems, comparative research is becoming increasingly essential, since it is one of the main sources for learning about economic, social and cultural effects. Efforts at co-operation between researchers coming from the same region or from different regions of the world should be encouraged, so that they can contribute to building up the capital represented by the studies being carried out.

This brief survey clearly underscores the imbalances in the research situation between the different regions of the world and the urgent need for remedying them. The bulk of the studies on the new technologies come from the advanced industrialized countries. The countries of the South are handicapped by a lack of research infrastructure and funding, although it is true that they are at present less concerned by the new technologies than the countries of the North. Even so, support for research in the developing countries appears to be particularly necessary, since those countries' researchers must not be relegated to being mere bystanders in the scientific community. They must be a full part of it, so that they can have access to the relevant data on the new technologies which are gradually spreading to their region and are giving rise to specific research needs.

The issues involved in the research being conducted in different regions of the world make it possible to draw up a list of questions relating to the economics of communication systems, the institutional and legal aspects, the cultural challenges they present, and their social dimensions and educational implications. These are the subject areas forming the linking thread in this synoptic view of things.

Chapter III

The explosion of information production

The 1980s were marked by a spectacular growth in the production of information, and this was accompanied by far-reaching technological, institutional and economic changes.

New technologies are giving rise to a sharp increase in the number and variety of infrastructural transmission and reception facilities and to a proliferation of information in all its forms, such as audio-visual programmes, software, data bases, and so on.

The 'information era' entails re-examining the very idea of information, which is becoming assimilated to an item of data that is produced, stored, processed and transmitted. Communication systems occupy an increasingly large place in economic systems. This 'revolution' is at the root of structural changes that are leading to a redeployment of the economic machinery of societies. In the industrialized countries, which are coming increasingly to be described as post-industrial, the information sector, comprising the production, processing and distribution of information, accounts for between one-third and one-half or upwards of the active population, according to the studies carried out by the Organisation for Economic Co-operation and Development (OECD). This situation is also spreading to some of the countries of Eastern Europe, like Hungary, and some of the new industrial countries of South-East Asia, for example.

This new deal for production is accompanied by institutional developments, since the new technologies are undermining the established order. The movement towards the deregulation of communication systems that has started in the advanced capitalist countries is contributing to the creation of new legal, political and economic structures that are bound to have an effect on international communication.

The upheavals in the field of information are many and varied and the complexity of these factors represents a challenge for the research community. A variety of problem areas are being developed and these cover, *inter alia*, the sectors of audio-visual communication, the computerization of societies and the transnationalization of communication systems.

The upheaval in audio-visual communication

The emergence of a new deal in audio-visual communication is reflected in a number of factors, including a substantial increase in the supply of programmes, the crumbling-away of the monopoly held by public radio and television, the appearance of new media strategies, and a new economics of communication.

The growth in the supply of programmes is partly bound up with technological innovations in hardware, which has resulted in a significant increase in the number of broadcasting channels. Cable, satellites and video have given rise to far-reaching changes in the audio-visual landscape worldwide and the invasion of programmes is spreading through all the world's regions.

The growing number of satellites offers programme production the possibility of extending its area of coverage and profitability both regionally and internationally. Almost one hundred satellites transmitting video images have been launched since the beginning of the 1980s. In addition, the recent arrival on the scene of direct broadcasting satellites in Japan and Europe (France's TDF1, Luxembourg's Astra and the United Kingdom's BSB) offers a foretaste of a new mode of transmission and the promise of being able to receive a host of programmes.

Cable is also making spectacular progress. Cable distribution networks are stepping up their capacities fivefold and can now broadcast more than 35 programmes, while the development of return channels is adding to this technology by providing interactive functions which are enabling multiservice television, such as tele-shopping, to appear on the market. Interactive television experiments via optical-fibre cabling systems are being conducted in various places. At the end of the 1980s, cable television facilities were most widespread in North America (the penetration rates in homes with television sets stand at 65 % in Canada and 50 % in the United States) and in the small European countries (Belgium 86 %, Netherlands 67 %, Luxembourg 66 % and Norway 25 %), while the other countries in the region are starting to be fitted out. Cable television also exists in some of the urban centres of the countries of Eastern Europe, such as Hungary

and Yugoslavia, and in some of the main cities of developing countries like Mexico and Argentina.

This new technical supply of television reception facilities is accompanied by a new supply of programmes, which is reflected, among other things, by the appearance of major theme channels devoted particularly to variety programmes or films (such as Home Box Office, Sky Channel, The Movie Channel, Première, etc.), or to music (Music Box, etc.), information (Cable News Network) and children's programmes (Disney Channel, Children's Channel, etc.). These new channels are broadcast via satellite relay to cable subscribers in North America and Europe, but some programmes can also be received by radio-wave.

However, the most significant worldwide revolution in audio-visual communication now lies in the explosion of video, which is a technology that is penetrating all cultures. The video recorder has now become an ordinary household commodity. The rates of penetration of video into homes with a television set are highest in the Arab States of the Gulf, where they can be found in about three-quarters of homes with a television set. In the industrialized countries, the penetration rates range between one-third and more than one-half of all homes, and the proportions are roughly the same in the new industrial countries, while some of the developing countries also show relatively high rates, with video becoming a common household item for the small fraction of homes with television.

Thus, the hardware and software explosion is leading to a withering-away of the models of monolithic television and mass broadcasting, and this is calling into question traditional communication patterns and is offering preferential areas of investigation for research.

The upheavals in the audio-visual sector are particularly marked in the advanced capitalist countries like Japan, North America and especially Western Europe, where the deregulation of national communication systems is giving rise to literal transformations.

In Western Europe in particular, the audio-visual scene is undergoing far-reaching changes bound up with the end of public audio-visual monopolies. In broadcasting, this development had already given rise in the 1970s to the proliferation of commercial radio stations on the FM band. The television sector has been opened up to private interests and is leading to a further host of channels. With the arrival of commercial television, many European countries which had had public television systems for several decades have now seen the number of channels available to them double or even triple. They have accordingly seen the creation of commercial channels like Italia 1, Rete 4 and Canale 5 in Italy, Channel 4 in the United Kingdom, 'la Cinq' and M6 in France and two private channels in Spain, or else pay channels like Canal Plus in France and Spain, and Kanal 2 and Week-End TV in Denmark.

Deregulation is a development which has been put into effect through institutional and legal approaches specific to each country. It is the subject of case studies and some comparative investigations. The research shows that the privatization and commercialization of the audio-visual media are accompanied by the creation of new legislative frameworks aimed at safeguarding the interests of the public channels, regulating competition and advertising markets, and setting quotas for the national programmes which the channels are required to broadcast. The new national legal dispositions are also accompanied by regional measures, such as those laid down by the European Community for broadcasting cultural programmes from the region. Even so, the rules of competition cannot be readily bent to comply with these rules and regulations, which are frequently the subject of infringement.

The fact is that deregulation gives rise to a far-reaching change in the audio-visual landscape that has a direct impact on public television. Audience surveys show, as in the case of France, that there is a significant decline in the number of viewers in favour of commercial television, even though, in the long run, the quality policy of the public audio-visual media can lead to a recovery in programme ratings, as experience in Italy has shown.

The evolution of national communication systems does not appear to be linked only to a change in the institutional and legal contexts. Countries that have not changed their audio-visual systems are also experiencing the effects of technological innovation. Satellite broadcasting is increasing the supply of programmes on offer in the countries of Eastern Europe, for example, which receive the transmissions of the first channel of Soviet television and even German or Austrian television in border areas.

In addition, individual viewers in some countries, like those of the Caribbean and Algeria, are coming increasingly to pick up foreign programmes by using dish aerials. However, this trend is still marginal compared with the spread of video which, according to the studies carried out, reduces the number of television viewers in the countries of the South, which find themselves having to contend with unprecedented competition. Thus, a kind of 'spontaneous deregulation' is appearing, but while this does not affect the legislation, it is, in fact, undermining national communication systems.

The new international audio-visual context is a source of profitable markets, which are accompanied by the emergence of new styles of industrial and commercial thinking and the strengthening of transnationalization. New media strategies are taking shape around the restructuring of communication groups and the increased pace of mergers, as the research shows.

The growth of the television market is therefore attracting major press groups, which are diversifying their activities. Multimedia conglomerates have primarily grown in the United States (as in the case of the Time-Life group, which owns HBO and Tristar Pictures, etc.) and in Japan, but they are also appearing in Europe, with the diversification of the Bertelsmann, Maxwell and Hachette groups, and in Australia with which the Murdoch group is already established on several continents.

The new markets are also arousing the interest of private groups which come from outside the communication field but are now gaining a foothold in the sector, such as the Berlusconi group, which owns several television networks in various European countries, and the Bouyges group in France which, although originally in the construction sector, bought out the first public sector television channel.

Mergers in the communication sector take a variety of

forms. Horizontal integration strategies tend either to bring together companies of the same kind, in order to benefit from economies of scale (mergers of production companies, for example), or else to diversify the activities of the companies (multimedia groups). Vertical integration, which makes it possible to control the whole range of production, programming and distribution functions, represents one of the current trends, as can be seen, in particular, in the cable television sector.

Current merger processes are highly complex and are an occasion for weaving a tangled web of different strategies that are being developed on both major domestic markets and international markets.

In the media sector, the studies carried out show that transnational enterprises belong to three different types covering either ownership or control of foreign cultural industries, or control of distribution networks in foreign countries, or else the occupation of dominant positions on international markets for the sale of media goods. The forms taken by the internationalization of communication groups now tend to be combined and are giving rise, under the pressure of vertical integrations, to the appearance of new conglomerates with constantly shifting frontiers that are still not clearly defined and which call for specific studies.

The transnationalization phenomenon, in which the press agencies were the first to be involved, subsequently spread to film production and distribution companies and now, with the expansion of satellites, also embraces the television production and distribution sector.

The bulk of the transnational communication companies controlling the international film and television markets are American or British, but other countries, like France, are also breaking into them. However, cinema and video production industries can also be seen to be growing in India, Egypt, Hong Kong, Mexico and Brazil, whose companies are operating increasingly along the lines of the transnationals, are becoming established in areas of regional culture and are even breaking into the international market.

The research done on international material flows, most of which has been commissioned by Unesco, is now well known. The findings point to the imbalance in the flow of material exchanges (information, books, records, films, television series, etc.), which chiefly take place in a North-South direction. At the moment, the growth in the supply of programmes is giving rise to a heavy demand and is adding even further to the overwhelming import of programmes, chiefly from North America, in the developing countries, as well as in other regions of the world, such as Europe, which do not have the same production capacities.

Some research has been carried out on transnationalization in the film, television and advertising sectors. Case studies have also demonstrated its impact on the communication systems of different countries, including Argentina and Thailand.

However, the recent appearance of new forms of transnational group mergers calls for more extensive research, with the aim of identifying more closely the way in which they operate and the strategies they apply, along with the effects which these have on the organization of international communication.

Another development in the audio-visual sector can be seen in the diversification of the forms of funding. Advertising is still a substantial source of income and the considerable increase in the number of commercial television channels offers it new markets, which often affect the share of advertising income going to the public channels. Research shows that the advertising sector itself is being caught up in the increasingly fast pace of mergers and that the transnational groups are strengthening their position and diversifying their operating methods. The new advertising strategies are geared to the adoption of a programme sponsoring or even bartering approach, whereby the advertiser produces and supplies a complete programme to a channel. Moreover, advertising companies are looking to the markets of other regions as a means of winning back the audiences they have lost in the industrialized countries as a result of the widespread use of video recorders and the intensive practice of 'zapping', which enables television viewers to use remote controls so as to avoid having to watch advertising spots.

The development of co-productions is also bringing in another funding method which makes it possible to cover the high cost of large-scale film productions. These operations bring together producers from various countries and are set up, in particular, between government agencies, as can be seen from a number of cultural projects carried out by public television networks in Europe or Africa.

Moreover, in North America, it is becoming common practice for private foundations to make donations to theme cable channels catering for special interests, such as religion or culture.

However, one of the most striking innovations lies in funding by the consumers themselves. This is obviously true of the hire or purchase of video films, but it also applies to television, for which various subscription formulas are being devised. Pay television is spreading on cable, with a toll being paid for gaining access to specific channels (pay TV) or programmes (pay per view). Radio networks are also gradually adopting this method, with the appearance of coded toll channels whose reception requires the acquisition of a decoder and the payment of a subscription.

The funding of audiovisual production is therefore coming increasingly to rely on the blending of resources and is resulting in a variety of scenarios that lend themselves to economic analysis.

This brief overview of the implications of the new technologies in the audio-visual production sector shows to what extent it is undergoing far-reaching changes on a worldwide scale. The considerable growth in supply is based on technological, institutional and economic factors involving a whole series of questions which research is only just starting to answer.

The advances made in telematics

In the proliferation of information worldwide, media products no longer occupy a preferential position in relation to the growth of specialized information. On account of their data retrieval, processing and transmission capacities, the new

technologies are contributing to the production and exchange of all kinds of commercial, financial, scientific and other information that is becoming an important factor in the world economy. Thus, as information cuts across all sectors of activity, its definition is being broadened. This new production of information is largely based on the interconnection of the technologies of informatics and telecommunications, which commonly goes by the name of telematics.

Research in this sector is still in its infancy and is distinctly less advanced than that on media communication, which is a discipline benefiting from a well-established tradition. Even so, it is starting to do pioneering work into some aspects of this vast area, which raises considerable conceptual and above all methodological problems.

The lightning growth of informatics in the 1980s has given rise to a new situation displaying two main features: the domination of transnational companies in this sector and a marked imbalance in the international distribution of this technology.

Indeed, the informatics industry established itself right from the start as a worldwide industry based on considerable product standardization. The bulk of hardware is built by mulinational companies which have affiliates outside their countries of origin and capture most international markets. Among these companies, IBM occupies first place and actually dictates international compatibility standards with its products. The main informatics groups are American (IBM, DEC, Unisys, CDC, NCR, Hewlett Packard) or Japanese (NEC, Hitachi, Fujitsu), even though some European countries have managed to carve themselves out a share of the market, like the German firm Siemens and the French firm Bull, or other smaller companies, especially in the field of micro-computers.

Moreover, the increased pace of computerization in the advanced capitalist countries stands in contrast to the backwardness in that respect of the other regions of the world, and especially the developing countries. According to the statistics of the International Data Corporation (IDC), in 1984 those countries accounted for only 6 % of the world informatics market, and that share was distributed unevenly between the following regions: Latin America 58 %, Asia 28 %, the Arab States 8 %, and Africa 5.3 %.

At the present time, the extent to which the world is fitted out with informatics facilities is still not precisely known. The fact is that the collection of statistics comes up against problems connected with methodology (standardized definitions of types of hardware) and with random and often illegal imports (especially of micro-computers) in certain regions, which cannot be systematically recorded.

Models of informatics facilities display different features, depending on the region. In the advanced capitalist countries, it is now possible to speak of the literal computerization of societies. Computers are spreading to all sectors of activity. For example, with computer-assisted design and robotics, industrial manufacturing is becoming increasingly automated, the press and the book industry are developing strongly with the introduction of desk-top publishing (DTP), while office automation is spreading more and more to the services sector. As a result of the lightning growth of microinformatics, small firms can be fitted out with this technology, and it is also spreading among private individuals. Surveys have shown that the rate of penetration of micro-computers amounts to more than one-third of all households in the United States and the United Kingdom, for example.

In the countries of Eastern Europe, informatics is less widespread but, following the initial fitting-out of large computer centres in government institutions and departments, micro-computers are now being produced, although still to a limited extent, and have quite recently been imported. According to the studies made, they are starting to be installed not only in various sectors of activity but in homes, as in Hungary, for example.

Furthermore, the developing countries do not represent a single monolithic bloc and three main categories can be distinguished from the studies that have been carried out.

Countries with large domestic markets, like India or Brazil, are encouraging the creation of an endogenous informatics industry. Their policies are aimed at building a core sector for the production of new technologies and at ensuring national independence in that sector. Even so, the protectionist policies adopted in the early 1980s have had to be relaxed, since local materials do not always meet the criteria of international competitiveness. These countries are now tending to adopt a policy in which a balance is struck between support for domestic industry and the import of certain items of equipment and components.

Those countries that are undergoing rapid industrialization but whose domestic markets are small, such as the countries of South-East Asia (Taiwan, Hong Kong and Singapore), produce a considerable amount of computer hardware for export. They benefit from their position as free zones and from a cheap skilled labour force and they are becoming a preferential location for the affiliates of expatriate transnational companies.

In the third category, the less developed countries are completely dependent on the import of both hardware and software. For the moment, their computer facilities are chiefly concentrated in government departments, which are fitted out with high-powered mainframes. However, this centralizing approach seems liable to be short-lived, since the often uncontrolled arrival of very large numbers of micro-computers in some countries, like Nigeria, is upsetting this scheme of things and is creating a new situation whose consequences are still difficult to predict.

In the software sector, the industrial merger phenomenon is distinctly less pronounced and a host of companies have launched out into the production of software. However, large corporations, such as service companies and data-processing consultants, can now be seen to be emerging, and these are endeavouring to occupy a dominant position on the international market. The main suppliers are still located in the advanced industrial countries, especially in Europe, but some of the countries of the South are also developing a software industry, as in the case of India, Mexico and those of South-East Asia.

Hence, the situation of informatics worldwide displays marked disparities in terms of both the provision of facilities and siting strategies. The transnationalization phenomenon is the overriding factor, especially as far as hardware is concerned. The leading computer groups enjoy guaranteed

returns which enable them to dictate the rules of productivity and competition to the disadvantage of small-scale producers.

Research in this field is focused primarily on the advanced capitalist countries most affected by computerization. It addresses a variety of problem areas, such as the acceptability and methods of dissemination of informatics, trends in company organization patterns, and the economic impact of informatics. Some work has also been done in Latin America and Asia on the repercussions of computerization in industry and the services sector. However, these studies tend to be limited in scope and there is a perceived urgent need for more wide-ranging and thorough research on the economic and social impact of informatics in the countries of Eastern Europe, in the new industrial countries, and also in the less developed countries to which this technology has likewise spread.

With the growth in informatics, there has been a corresponding growth in telecommunications and, as a transmission infrastructure, they have made considerable strides in recent years. This industry which, in terms of size, represents three times that of the informatics sector, is in full expansion. The sector is dominated by Japanese, European and American companies, which are the main exporters of equipment all over the world. The steep increase in the number of channels carried by radio wave or submarine cable or by satellite has significantly stepped up the transmission possibilities, while the interfacing of telecommunications with informatics is giving rise to transfrontier data flows that have become a dominant feature of international exchanges.

The activities involved in entering, processing, memorizing, storing and disseminating data form a major sector for the production of specialized information. The content of this information covers a variety of fields, including administrative, commercial and financial information, scientific,technical or educational data, and files. This information sector is especially highly developed in the advanced capitalist countries and has become a key factor in their economies.

There are a large number of clients for specialized information, including governmental and international institutions, research and documentation centres, industries and the services sector. Hence, it is essential to be equipped with data terminals in order to have access to this information. The 1980s were marked by a rapid increase in the world stock of data terminals, but the statistics collected in the *World Communication Report* show that while every industrialized country has tens of thousands of units, the developing countries each have only a few hundred in the best of cases, and usually many fewer.

On a worldwide level, the exchange of specialized information represents a substantial share of the international economy whose turnover, failing the existence of precise statistics, is estimated overall at several billion US dollars. Service activities and high information-consuming industries, such as financial institutions, airlines, insurance companies and multinational enterprises, are the main participants in transborder data flows.

However, research in this area comes up against serious difficulties, since statistics on the volume of these exchanges are virtually non-existent. As the *World Communication Report* stresses, quantified information on these transfers is not available from the international telecommunications authorities responsible for evaluating world traffic, since the carrier activities of the telecommunications agencies do not allow them to go into the content of the transmissions, and hence to distinguish between the different types of exchanges occurring on the circuits. Moreover, this information is seldom recorded in the accounts of the user companies, which generally regard them as confidential.

In spite of these constraints, some research has been carried out on this sector and is raising a number of economic, institutional and legal issues.

Some of this research deals with the interdependence that has come to exist between the world economy and transborder flows and underscores the contribution which those flows make to strengthening the dominant position occupied by transnational companies (by providing information on markets, competition, prices, and so on).

Other research enquires into the role and place of the developing countries in these information circuits. The participation of the less privileged countries in these exchanges can afford them access to data series, especially on science and technology, that are concentrated in the industrialized countries and prove very useful for development purposes. But the studies also illustrate the situation of dependence fostered by such flows, since those countries are major suppliers of information of a primarily economic and commercial nature (on natural resources, markets, competition, etc.), which is transmitted and processed in the industrialized countries, often for the benefit of the transnationals. Transborder data flows thereby provide an opportunity for the reproduction of the international division of labour, since the developing countries are producers of raw materials (in the form of data), which are then manufactured in the countries of the North.

There has so far been scarcely any research in this sector, which should elicit greater interest and calls for considerable empirical work in order to make it possible to gauge, in concrete terms, the effects of transborder data flows on the economic systems of the world's different regions.

The network era

The growing interconnection of telecommunications, informatics and the audio-visual media is instrumental in considerably stepping up the number of information transmission circuits, which are coming to be increasingly organized into networks.

Modern communication networks are currently undergoing a far-reaching process of change. The new technologies are primarily at the root of an improvement in the traditional networks, such as the automation of the telephone network and the considerable increase in data-carrying capacities. The new technologies are also at the origin of the creation of new technical networks, such as telematics and direct-broadcasting networks, or economic networks, with the emergence of new operational and management structures.

The impact of this new 'network era' on the different regions of the world is starting to be seen and is probably only the forerunner of more significant upheavals to come.

The new communication networks are opening up considerable scope for research, which is coming up against the complexity of the systems being established at the level both of infrastructure and of contents and operating methods. There has not yet been very much research in this area and the issues involved relate to the current proliferation of networks, the variety of their technical, economic and institutional configurations, and their effects on the international communication system. The idea here is to point to the main innovations connected with network development that have been surveyed in the research carried out.

The network concept is now associated with that of new services. These are generally described as value-added services, which represent a high market value.

Professional users are the main clients of the new communication services, which include telecopying, videoconferences, access to data banks, remote data-processing and electronic mail. All these services are offered through a large number of networks, but the appearance of wideband networks, which enable large amounts of information to be carried in digital form, is leading to the regrouping of these circuits.

Among the new circuits, those for videotax occupy an important place. By using the telephone network and its interfacing with a computer fitted with a modem or a special terminal, this new technology makes it possible to have access to a large number of data banks, engage in commercial transactions and dispatch electronic mail. Videotex has given rise to a whole series of professional applications.

Professional networks, both inside and outside companies, are growing rapidly and are the subject of economic studies which measure their effects on the life of enterprises (their productivity, performance and internal organization) and the changes they bring about in terms of employment (changes in job functions, staff cutbacks, etc.). The findings of the surveys carried out vary, but they all concur in acknowledging that the networks give rise to new methods for managing and disseminating professional information.

Households are also coming increasingly to be connected to the networks. For instance, television sets become data-bank terminals with the appearance of teletext, which is broadcast by radio and which, with the aid of a decoder, ensures access to general information such as news, weather reports and entertainment. This new service is not interactive and is still confined to some of the advanced industrial countries and to a few Socialist countries, like Hungary. By contrast, cable networks are introducing multiservice interactive television which, through its return channels, offers new tele-shopping and distance education services. These services have been chiefly developed in North America.

Private individuals can also have access to the telematics network and videotax provides them with a wide range of information and business services, such as banking operations and tele-shopping, and leisure activities like games and electronic messages. Telematics for the general public is, for the moment, above all widespread in France, where it involved about 15 % of all households in 1989.

Private consumers represent a vast potential for networks and research has already been undertaken on the coming development of *domotics*, or 'home automation', which will provide tele-management and tele-security services, among other facilities.

In the current flowering of networks the most technologically advanced form is foreshadowed by the Integrated Services Digital Network (ISDN), which is designed for both professional and home uses.

In 1986, the European Community adopted a recommendation for the coordinated introduction of ISDN into the Community, covering standards, tariffs, services and the timetable. The ISDN is still in its infancy but, from the early 1990s onwards, it will make it possible to improve telephone communications and the conveyance of a wide variety of teleservices, ranging from telephony to telecopying and data transfers. The Integrated Services Digital Network is also being developed in the United States and Japan. Researchers are taking an interest in the strategies developed by the operators and suppliers of services, in economic forecasts on the efficiency of the system, and in the types of service likely to be offered.

The new interactive services, which are intended for both private and professional consumers, are being expanded and are concentrated in the advanced capitalist countries, where they are giving rise to a series of studies on their dissemination and uses. They are the forerunners of a new form of communication and are already starting to be set up in other regions of the world, as in the case of videotex in Brazil.

High-technology networks are being developed in terms of essentially commercial thinking and the new services they offer are generally subject to high tariff rates. This new market-oriented approach to information runs counter to the public-service information model and is instrumental in changing the role of users, who are being increasingly turned into customers.

The growing marketing of information is now the dominant pattern. This is partly bound up with the current movement towards deregulation, which is involving a vast restructuring of the telecommunications field. The monopoly in this sector has already crumbled away in the United States and Japan, and there are signs of it partly doing so in Western Europe. The current trend is towards the integration of traditional communication services with the new data transmission and teleprocessing services. Traditional telecommunications operators are increasingly diversifying their activities, as in the case of the Bell Operating Companies in the United States, while new private operators are entering the market. The lucrative telecommunications market is changing fast and is the subject of considerable research devoted to analysing the strategies at work, the new participants and the appearance of fresh mergers.

The networks are new and highly profitable markets which are attracting the covetous looks of large companies and are giving rise to the emergence of a new kind of industrial and commercial thinking. They provide the opportunity for the development of vertical mergers, in which new alliances are being formed between the sectors engaged in the production of information and in its processing, trans-

mission and distribution. These new integration strategies are particularly significant in the cable television sector, where studies have shown the appearance of conglomerates bringing together cable operators and producers in association with video companies and film studios.

Research shows that the deregulation of telecommunications systems does not only have an impact in the countries where it is put into effect. It also affects international exchanges by gradually introducing other management rules and price systems which disrupt international competition.

For instance, intercontinental space communication networks are affected by the entry on the market of new private operators, such as the American Pan Am Sat or Luxembourg's Astra satellites. The growth of the space telecommunications market and the place occupied by data transmission and professional services are at the root of the keen competition between operators, especially on the North Atlantic axis, on which the heaviest volume of traffic is recorded. This competition is altering the tariff basis.

The satellite market is in full swing and is evolving with the space programmes of the developing countries. These countries' satellites are also being affected by the growth in commercial information flows, and studies have shown that the trend is for the educational and development objectives of the satellites promoted by those countries to give way to lucrative data-transfer applications for large private firms and transnational corporations. This departure from the original aim has been particularly studied in the case of the Brasilsat satellite.

The start to deregulation in the space communications field represents a challenge to the international satellite system Intelsat, which is based on co-operative principles and operates under a cross-subsidization system which is favourable to the less-privileged countries not having their own satellite. Thus, the privatization of space communications is giving rise to the appearance of different satellite systems, which may be national, regional or international in scope, and to increasingly diversified transmissions in terms of both content and tariffs. This development opens up a vast area for research.

Moreover, in the long run, the development of fibre-optic digital networks, which have the preference of operators in the industrialized countries, is bound to have an effect on the satellite market.

Another line of research is concerned with the transnationalization process triggered off by the networks. These are contributing to the strengthening of transnational companies, which dominate the market for both the international trade in media products and transfrontier data flows. These companies deal in both hardware and software and their strength is based on intensive capital concentration and aggressive strategies aimed at establishing themselves on the world market.

Alongside the domination wielded by American, Japanese and European companies, new participants are emerging from the industrializing countries and are engaging in the international trade in audio-visual products by creating new regional distribution networks and in the supply of telecommunications infrastructures in their areas of influence.

The importance attached to conquering markets is contributing to heavy investment in technological research. The rich countries are allocating considerable funds to research and development. The competition of American and Japanese companies in this field has prompted the European Community to set up a large number of co-operative programmes in the science and technology research sector. Following the success of the Esprit Programme (European Strategic Programme for Research in Information Technologies), which was launched in 1984 and has resulted in the financing of several hundred joint research projects among the Community's industrialists, in September 1987 the Council adopted an outline research and development programme for the period 1987-1991, in which 40 % of the projects are devoted to information and communication technologies. For instance, the Race Programme (Research in Advanced Communication in Europe) comprises some fifty projects involving both wideband technologies and the development of networks and the strategies for their implementation. In addition, the Eureka project, whose frontiers go beyond those of the European Community, is encouraging research in various high-technology areas, such as high-definition television. In the technology race, some of the countries of the South are also endeavouring to develop research and development poles, such as India in particular.

The new information technologies are leading to an ever-widening gap between the industrialized countries, where they are largely concentrated, and the rest of the world. The bulk of the information exchanges take place in the triangle formed by North America, Japan and Western Europe. The countries of those regions are the largest exporters and importers of both hardware and software. In point of fact, the multinationals make 80 % of their turnover in those regions. The other regions are opening up to varying degrees to the new technologies being developed in some of the countries of Eastern Europe and in some industrializing countries, while the less developed countries are being increasingly relegated to the sidelines.

The situation worldwide is moving towards an intricate pattern of different kinds of networks whose configurations are becoming increasingly difficult to grasp. These networks are the subject of keen competition between the leading communication groups. The outcome at stake is the take-over of vast areas of domestic and international markets which are becoming increasingly oligopolistic.

The new networks created by the advanced technologies are intertwined and are becoming more and more complex. They are contributing to increasing the interdependence of world communication systems and raise the issue of the interpenetration of the market and Socialist economies and the long-term effects which this could have.

The sheer scale which the networks have assumed worldwide appears to be one of the major features of present and future developments in communication and is leading to a new 'geo-communication' which calls for a considerable research effort.

Chapter IV

The new legal and political issues

The proliferation of information is accompanied by far-reaching changes which affect the very nature of the information itself, and hence its status. The dematerialization of information goes hand in hand with the growth of invisible exchanges which cross frontiers in all transparency and increasingly escape the control of governments. Transfrontier television is undermining the principles of national sovereignty. Communication networks are growing more and more complex at the national, regional and international levels alike, posing a real challenge to the control wielded by the regulatory authorities. The virtually exponential rate at which information is advancing has to be seen in the context of a vast marketing process which, combined with a cutback in public services, is dictating new forms of competition affecting the balance of international co-operation.

In the leading Western countries, communication systems, whether involving telecommunications or radio and television, are already being deregulated. The thinking behind this seems to be that State intervention in the communication sector should be reduced and that the main form of control should be the market. The communication systems of the industrialized countries were built on *de jure* or *de facto* monopolies or oligopolies. However, economic development and the emergence of the new technologies have created an imbalance in the existing systems and have called into question the old rules and regulations; the growing interweaving of data-processing techniques and telecommunications is thus bringing sectors that were traditionally governed by different rules into contact with each other.

The deregulation of communication systems is a complex process involving forms of legislation and methods for their enforcement that differ from country to country. It has resulted in the breaking-up of telecommunications monopolies — as in the case of ATT in 1984 and the challenges both to Intelsat in the United States and to the Nippon Telegraph and Telephone Public Corporation (NTT) in Japan — and the privatization of public telecommunications agencies, such as British Telecom in the United Kingdom. In the audio-visual sector, the abolition of the public monopolies running most of the communication systems of the countries of Western Europe has given rise to commercial television channels, pay channels, local radio and television, and the creation of independent supervisory bodies like the Cable Authority in the United Kingdom and the *Conseil supérieur de l'audovisuel* in France.

In addition, communications are becoming increasingly international in scope as a result of the rapid strides made both by the new technologies, which are breaking down frontiers, and by the large industrial groups; this situation is creating a need for new rules with international, regional and national scope. Furthermore, the coming prospect of wideband networks and high-definition television is posing new challenges which are making it necessary to rethink the existing legislation: it is no longer merely a question of making technical choices but one of opting for a particular kind of society.

The information explosion is therefore creating *de facto* a new challenge for individual governments and for the international community. The problems posed are many and varied and raise a number of fundamental questions, some of which are discussed below.

Control

The often chaotic appearance of new hardware and software for the informatics, telecommunications and audio-visual sectors means that technological progress is becoming more and more difficult to control in the vast majority of countries, and attempts to plan the balanced development of the various facilities available are proving less and less effective.

Security

As a result of their complexity and extensive coverage, large communication networks, and especially wideband networks carrying different types of signal, are increasingly vulnerable. The interdependence of the systems increases their vulnerability, and disruption at any one point involves a serious risk of knock-on effects. But technical deficiencies are not the only threat: the possibilities of sophisticated computer fraud and the deliberate destruction from a distance of large computerized data and transmission systems cannot be ruled out.

Protection

The new technologies call for the introduction of protective measures in various fields. The defence of industrial and intellectual property raises the problem of copyright rules to protect creators and producers of audiovisual or computer products, which are threatened by the international scale of piracy in this sector. The proliferation of data bases makes it necessary to protect individual freedom and privacy. Lastly, the new economics of land-based and space telecommunications and transborder data flows require the drafting of new regulatory frameworks guaranteeing the principles of international co-operation.

National sovereignty

The new international communication networks are coming to be more and more interdependent and no longer coincide with geographical frontiers. Unlike national territories, they overlap and are introducing a new concept of communication space. Transborder data flows and television beamed across national frontiers should lead to a re-examination of the whole concept of national sovereignty which is becoming seriously undermined by the internationalization of information circuits. The problem which national authorities have to face can only be resolved by concerted international action.

These are the main points that have to be considered in the context of the legal aspect of the problems raised by the new communication technologies. National governments and the international community are, in fact, having to contend with situations that are both unprecedented and extremely complex. It is not the purpose of this document to go into details of the legal debates and instruments, which would warrant a document of their own. The aim is merely to note the main legal and political implications raised by the dissemination of the new technologies, before going on to discuss the international dimensions of computer and audiovisual piracy and to touch on the philosophical and political background to the legal issues.

The legal and institutional dimensions

The growing internationalization of communication systems has come about almost spontaneously and has shown how unsuitable the existing legal instruments are for controlling this activity. The specific nature of the new communications equipment and products sets them outside the traditional regulatory framework that has hitherto governed communication systems. The new technologies were therefore initially developed in what was virtually a legal vacuum, which was only filled by the gradual adoption *a posteriori* of international, regional and national regulatory instruments. These new instruments do not yet cover all the problems raised, but they represent the first steps towards a new international regulation of information.

Software protection involves serious legal problems bound up with the nature of the product, which could come within one or other of the categories of legislation pertaining to copyright, patents, trademarks or trade secrets. The leading industrial countries have applied copyright legislation to software, and laws for that purpose were adopted in the United States in 1980 and in Japan, the United Kingdom, France and the Federal Republic of Germany in 1985. Other countries, including India, the Philippines, Hong Kong, Mexico and Hungary, have also adopted legislation along the same lines. Some countries have applied the legislation on trademarks (Norway, Switzerland, the Republic of Korea) or trade secrets (Finland), while others, such as Belgium, have adopted both systems.

According to the *World Communication Report*, the copyrighting of software is giving rise to some controversy from the standpoint of the Berne Convention and the Universal Copyright Convention which deem that copyright protection applies only provided the software is readable by anybody, which is seldom the case. In addition, the question arises of how to identify individual contributions to software production. Furthermore, abuse of copyright provisions designed to protect systems software might lead to the monopolization of hardware, which would infringe anti-trust laws. This brief overview of the current controversies shows that further research on software protection is needed in order to define its status more clearly.

The serious problem of audio-visual piracy, i.e. the illegal copying of audio-tapes, films or video-cassettes, has been tackled in some countries which have passed laws to prohibit that practice and punish offenders. In addition, a joint meeting of the World Intellectual Property Organization (WIPO) and Unesco, held in Paris in 1986, adopted a resolution encouraging Member States to adopt legislation likely to ensure respect for the ownership rights of audiovisual authors and creators, as guaranteed under international conventions. In 1988, the Committee of Ministers of the Council of Europe adopted a set of recommendations on private sound and audio-visual copying and on measures aimed at combating piracy in the field of copyright and neighbouring rights. A large number of countries have drafted appropriate legislation, but illegal copying is nevertheless taking on considerable proportions all over the world.

The proliferation of data bases, some of which contain information on people's jobs, health and other personal matters has also given rise in some countries to the adoption of specific legislation aimed at safeguarding individual freedom and privacy and preventing improper use of the data; similar provisions are being studied in many other countries. In 1980 and 1985, OECD adopted a set of directives concerning transfrontier personal data flows, while in 1986 the Parliamentary Assembly of the Council of Europe adopted a recommendation on data protection and freedom of information.

In the telecommunications sector, the upheavals caused by the considerable increase in the number of networks, digitalization of circuits, deregulation of the American and Japanese systems, and the appearance of new value-added services prompted the International Telecommunications Union to review the existing regulatory framework. In 1988, the World Administrative Telegraph and Telephone Confer-

ence held in Melbourne concluded the first international treaty for integrated global telecommunications networks and services. The new international regulations in this sector should make it possible to take steps to ensure the interconnectivity of networks offered to the public, to set up specialized networks and services and to develop accounting practices for revenue transfers. The new treaty is due to come into force in July 1990.

In addition, there is still the question of the status of international telematics exchanges, which gave rise to the first global round of negotiations in GATT (General Agreement on Tariffs and Trade), at its Ministerial Conference held in Uruguay in 1986, where the subject of trading in services (such as telecommunications, information, films, advertising, monetary flows, insurance, education, travel, scientific data and legal services) was raised. There is still disagreement between such countries as the United States which advocate free trade and are seeking a multilateral agreement on the total liberalization of these services, and other countries which regard this as a threat to the preservation of their national sovereignty and culture.

There is also a series of international instruments governing, *inter alia*, data exchanges, direct satellite broadcasting and the circulation of information, which have been adopted in the United Nations system by such specialized agencies as Unesco, the World Intellectual Property Organization (WIPO) and the International Telecommunications Union (ITU).

However, these legal problems are not being discussed solely at the international level; they are also the subject of recommendations and regulations at the regional level.

The Latin American countries have, for example, embarked on a process of concerted regional action initiated by the *Club de Cali* in 1984, while the Planeta project on new strategies for advanced technologies is contributing to the prospect of setting up a community area embracing the region.

The African countries are endeavouring to cope with the problem of fitting themselves out with the wide and uncoordinated assortment of new technologies available by developing a regional co-operation policy. The need for an 'African Joint Technology Development Project' was voiced in the declaration made by the Yamoussoukro Group in March 1985.

At the present time, however, the most significant regional attempts to harmonize communication policies are to be found in Europe.

For instance, in 1976 the Council of Europe adopted a general programme on the media and activities connected with information and communication.

More recently, technological developments have prompted that organization to take further steps. In 1981, the Council's Parliamentary Assembly adopted a recommendation on various aspects of cable television and direct satellite broadcasting. In 1983, a Plan of Action was drawn up for satellite television containing, *inter alia*, recommendations relating to the regulation of advertising. In 1984, the Committee of Ministers adopted a recommendation on the use of satellite capacities for television and sound broadcasting. In 1986, a recommendation was adopted on copyright in relation to satellite and cable television and on the adoption of a cultural policy for protecting European creators and improving the scope for creation and distribution. The Council of Europe has also held several Ministerial Conferences on transfrontier television to draft a European Convention designed to lay down minimum common rules on the transfrontier circulation of television programmes, to guarantee freedom of reception and to establish basic rules for programming, the protection of young people, the transfrontier right of reply, editorial independence, European programme content and rules on sponsorship and advertising. This Convention was adopted on 15 March 1989 and had been ratified by ten States by May 1989.

The prospect of the European Customs Union at the end of 1992 has also prompted the European Community to take a series of measures aimed at creating a unified European market for information, telecommunications and the audio-visual media.

The Community's approach to the development of a European audio-visual area is geared to authorizing the reception and retransmission in all Member States of broadcasts complying with a set of specific requirements. In 1985, the European Community published a Green Paper on the establishment of a common television market. Such aspects of European transfrontier television as the broadcasting of programmes and the possible setting of quotas are being widely discussed. European arrangements are also being studied for regulating advertising (time-limits, the prohibition of tobacco advertising, etc.), for protecting young people (measures against pornography, violence and racism), and for defending copyright. These arrangements are set out in in the common position adopted by the Council on 13 April 1989, which is aimed at co-ordinating television broadcasting, and they are also at the origin of the 'Television without frontiers' directive adopted on 3 October 1989. There is also the Media programme, designed to encourage the development of the European television programming industry at the production, distribution and funding levels, by providing assistance to encourage programmes with a Community dimension. In addition, in October 1989, the countries of the European Community, the Council of Europe and four countries of Eastern Europe adopted an 'Audio-visual Eureka' plan for strengthening their television production capacity.

One important area of activity of the European Community is concerned with the harmonized development of hardware and networks. The Integrated Services Digital Network (ISDN), plans for which were approved in 1986, foreshadows the most advanced form of this co-operation. A set of directives was adopted on standardization, which is the cornerstone of the opening-up of the networks and their interconnection, and action is being taken on accessing to data bases. In 1987, the European Community published a Green Paper on the development of the common market for telecommunications services and equipment. Finally, with the publication in 1988 of a Green Paper on copyright, it addressed the legal obstacles relating to electronic fraud, the authentification of electronic transactions, the responsibility of information services, and intellectual property.

The proliferation of information is therefore being

accompanied by attempts to regulate the new communication market. Even so, drawing up a new international legal framework to control the development of the information sectors raises very complex issues: the problem of piracy occasioned by the spread of the new technologies is one example highlighting the limits inherent in legislation in this area.

Computer and video piracy

International conventions on intellectual property are constantly being violated in respect of the products of the communication industries, and the financial losses suffered in the music, book, film and software sectors are estimated at several hundred million US dollars.

This endemic phenomenon is widespread in all the regions of the world, since the illegal copying of these materials is a straightforward and quick operation which, as a result of technological progress, can be performed by private individuals. Even so, crime in this field takes a variety of forms and a distinction has to be made between copying for private purposes — now a current and indeed commonplace practice — and the production, in a virtually industrial form, of fraudulent imitations or copies for commercial ends.

Computer software, for example, is regularly reproduced on an industrial scale in a small number of Asian or Latin American countries. This practice is accompanied by wholesale borrowing from programming manuals and data-processing publications. The networks for distributing these products have international ramifications and the result is a heavy financial loss for the creators and manufacturers of the original software, who are robbed of their rights.

Computer piracy is, however, highly developed in the industrialized countries. Young data-processing enthusiasts thoroughly enjoy exercising their ingenuity by outwitting software protection systems. In addition, illegal copies of software are made in a large number of organizations and frequently account for the bulk of the programmes possessed by private individuals who own micro-computers.

Besides its commercial and financial consequences, the worldwide scale of this phenomenon also has an effect on the security of data-processing systems which are jeopardized by viruses that are spread by illegally copying and reproducing software.

The forms of legal protection adopted in a bid to stamp out computer piracy are now proving to be of only limited effectiveness. Many countries have adopted copyright regulations aimed at protecting the intellectual property of the software, as already mentioned. However, further study has revealed the difficulties that have arisen in enforcing the legislation.

Even in the advanced capitalist countries, it is virtually impossible to control individual piracy, which generally takes place in people's homes, or the circulation of illegal copies among private individuals.

In the developing countries, the situation is even more complex. Studies that have been carried out with Unesco's assistance in five countries of the Asia and Pacific region (Australia, India, Malaysia, Philippines and Sri Lanka) have shown that the copyright legislation adopted to protect the intellectual property of software, which provides for severe penalties against offenders, was very difficult to apply. The administrative machinery that had to be set up to ensure compliance with the legislation is so cumbersome and costly that it is beyond the means of the countries concerned, especially since such machinery is primarily designed to cater for the interests of foreign copyright holders because the bulk of the software concerned is imported. Hence, piracy is still widespread, in the absence of any effective means of putting a stop to it.

The software situation has certain special features in the developing countries. Among those countries some, like Malaysia, have not set up any import barriers, while others have imposed high import duties which may amount to as much as 60% of the price of the product, as in the case of India which is endeavouring to protect its own domestic software industry.

Research has shown that the world trade in software is chiefly oneway, with the industrialized countries exporting their products to the developing countries. However, the often prohibitive cost of software for the latter, which are not granted preferential tariffs, fosters the development of a parallel market of illegal products that are available at much lower prices. The inequality of the terms of trade in this sector therefore gives rise to conflicts of interest and underscores the fact that software copyright represents much more than a mere legal problem and has highly significant economic and structural implications.

Video piracy is another result of technological progress and likewise represents a widespread international phenomenon. The random and largely uncontrolled proliferation of illegal copies of films is bound up with the size of the video market which has grown at a startling rate in the course of the last decade. The legal steps taken to check this situation have made it possible to curtail the practice in some countries, but they have proved distinctly less effective in some regions of the world where piracy is still very widespread. Illegal copies of video films still account for a high proportion of the market in many countries of Latin America, the Caribbean, Asia, the Arab States and Eastern Europe.

Piracy in this area takes a variety of forms, the most widespread being the copying by private individuals of video films or of previous copies which are circulated through private networks. Regulation in this field is limited out of respect for individual liberties, but some countries have partially solved the problem by levying a tax on blank cassettes, the proceeds of which are paid to copyright holders' organizations. In other countries, however, the adoption of this measure is being opposed by consumer interest groups.

But there is also organized large-scale piracy, which has created an international market for illegal copies. Importing copies of video films without the payment of copyright is common practice. Unauthorized copies of films are also made as soon as they come out and are sent to different regions of the world before the official version has been imported. Packaging is also imitated in an endeavour to circumvent censorship legislation, and X-rated films are circulated under

the label of adventure films, which only represent the initial section of the actual pornographic product.

Nor is copyright of films reproduced on cassette protected to the same extent all over the world. In some regions, either there is no legislation for the purpose, or else it is not very strictly applied. Nevertheless, a large number of countries now have legislation designed to ensure compliance with the property rights of creators and producers and providing for retaliatory measures against offenders. However, these legal measures are not harmonized and, by the time they were belatedly adopted, the piracy market was already well established.

The adoption of this legislation was often accompanied by raids on video shops and the confiscation of illegal copies has made it possible to reduce piracy to a significant extent in some regions. In the United Kingdom, for example, the rate of illegal video copying fell from 50% of the market in 1982 to 20% in 1988. In 1984, the European Community adopted a resolution aimed at combating video piracy. A significant reduction in this form of crime has also been recorded in Australia and Venezuela, and the very poor quality of the pirated materials in the latter country has been instrumental in furthering adoption and enforcement of the legislation.

However, the problem of how to enforce legislation arises in many countries which do not have the considerable means required to control the dominant activity that piracy has become. In India, for example, the two sets of amendments to the laws on copyright and the cinema, adopted in 1984, are aimed, firstly, at subjecting video films to the issue of a compulsory censorship certificate, ensuring compliance with property rights and combating piracy and, secondly, at selling the copyright for films jointly to cinema distribution and video reproduction circuits.However, while the content of these laws is strict, they are having scarcely any practical effect.

The video film explosion in India can be gauged from the vast number of places where they are shown. The studies carried out at Unesco's request show that there are about 100,000 video theatres and that video films are also shown in 5,000 buses, 10,000 hotel rooms and 1,000 clubs. This situation has prompted several States of the Indian Union to impose a licensing requirement on public video film centres, so that tax can be collected on the film showings. Hence, video theatres have become legalized, as it were, whereas the video films they show still largely consist of pirated copies.

This example points to the considerable difficulty encountered in combating video crime. The same situation exists in many other developing countries where the *de facto* situation seriously inhibits the enforcement of legislation.

The question of professional ethics is another legal aspect raised by the spread of video. The size of the pornographic-type video film market has prompted many countries to take specific measures. In the United Kingdom, for example, the Video Recordings Acts of 1984 requires video films to have a registration certificate complying with the classification rules of the British Board of Film Classification. However, the censorship of obscene video films introduced in some countries has sometimes had untoward effects, since a parallel underground market has grown up for these products; this has happened in Australia and some of the countries of Eastern Europe. The prohibition of the import and distribution of films of this type is proving just as ineffective in the Arab States, owing to the many different circuits by which the legislation can be circumvented.

However, studies show that there has been a distinct decline in X-rated video films in several countries, including Japan, Poland and the United States, because the initial vogue for this type of material has died down and it appears that the loss of interest plays a role in that respect that is as important as, if not greater than, the legislation.

Video piracy has serious effects in several different spheres. In the first place, it results in direct heavy financial losses for the countries producing films, notably the United States, but also other countries such as India and Egypt, which occupy a leading place in world film production. The Egyptian film industry is serious affected by the large number of illegal copies made as soon as its films have been completed. Copies of these films arrive immediately in the Gulf countries and then are re-introduced into Egypt, all these operations taking place without any copyright fees being paid. As a result, the country loses the foreign exchange it would have earned on its exports and the film directors, producers and distributors are deprived of a source of income. The same is true of the Indian film industry which, with almost one thousand films a year, is the world's leading producer but is now going through a serious crisis.

The distribution and screening of films are also severely affected by the video explosion. The official distribution of films is circumvented by the fact that they are illegally distributed beforehand on video cassettes and cinemas have been recording a considerable fall-off in audience. Some countries, like Jordan, have had to close down a large number of cinemas. The wealthy countries are managing to withstand the video invasion better by setting up cinemas with high-quality viewing facilities, complete with wide screens and Dolby stereo sound, and audiences are being attracted back into these types of cinema in both the United States and France. However, this policy of setting up luxury cinemas is beyond the financial means of many countries and their film distribution and screening circuits are fast disappearing.

The national television networks of the developing countries are also experiencing increasing difficulties. They are losing their audiences to video and the efforts they have been making to attract them back by buying, for example, foreign television series, are being thwarted by the fact that the same products have already been circulated on video. The television advertising market is also being affected by the loss of public interest. Even so, some countries have adopted vigorous policies to check the situation and Malaysia, for example, has authorized the creation of a third private television channel, in an endeavour to offer high-quality entertainment programmes and thereby attract viewers, especially in the Chinese community, and entice them away from video, which is responsible for the fragmentation of audiences. This measure is tending to restore television's role as a factor of national integration.

The implications of video development are countless and the technology involved has complex links with the different sectors of the media economy, including the cin-

ema, television and advertising. As matters stand at present, the problems encountered in attempting to control this medium have sometimes produced untoward effects and the legislation has not yet managed to stamp out piracy. Yet video offers an inestimable resource potential for film development, since the collection of copyright dues affords a means of giving a fresh lease of life to the film industry and fosters audio-visual creation. Competition can thereby foster complementarity, from which the different media can all benefit.

The legal question accordingly embraces issues that are cultural as well as economic and are decisive for the international future of the civilization of the image.

The law and the concept of information

The range of questions raised by the drafting of legislation consonant with the development of the new technologies opens up considerable scope for research.

The new legislation, in the form of the conventions, treaties, agreements, regulations, recommendations or directives that have already been adopted or are being studied at international, regional and national levels, represents an attempt to open up and regulate an information market that is growing rapidly. The vast increase in the types of equipment, transmission and reception facilities and products available for both telecommunications and the audio-visual media is giving rise to a steep growth in information flows, in turn giving rise to a series of new legal issues.

The current trend is characterized by a proliferation of increasingly complex networks and by a global information marketing process that is spreading to many sectors. Faced with this growth of information systems, legal concepts of what constitutes information differ widely.

The legal definition of information is at the heart of the problem. Information sometimes tends to be likened to a simple commodity. However, the European Court of Human Rights has handed down a ruling stipulating that information and televised exchanges come within the scope of services as opposed to goods.

Moreover, the free circulation of information is a topical issue and various international organizations are now studying the question of whether, for example, broadcasting should be considered as a service that has to be allowed to circulate freely.

There is still controversy between the advocates of *laissez-faire*, for whom free trade is assimilated to the concepts of economic freedom and democracy, and those who favour regulating the free circulation of information, to ensure respect for pluralism and a more balanced exchange of information between the different regions of the world.

These tenets are not cast in a hard and fast mould, however, and the positions held may vary in degree, depending on the sectors under discussion. The debates on the New World Information and Communication Order have now evolved towards more pragmatic positions aimed at promoting both the international circulation of information and the communication capabilities of the developing countries.

The tariffs applicable to international information exchanges are still also a crucial issue. The commercial development of land-based and space communications and the emergence of new private participants are stepping up the competition. In this context, the question of the tarification of the international satellite telecommunications system is again coming to the fore. The adoption of methods of calculation linked to the magnitude of the flows recorded is liable to change the system of cross subsidies between users, which has hitherto been favourable to the poorest countries. Specific studies are therefore needed in the context of respect for the principles of international co-operation.

The regulation of international communication activities also gives rise to the problem of conflicts of jurisdiction between international, regional and national authorities. The steps taken at the supranational level may be inconsistent with national measures in a variety of areas, ranging from commercial policies to questions of ethics. The conflict between different concepts of information can be seen in many regions, and even within the European Community. The principles adopted with respect to the free circulation of information may contravene some Member States' administrative regulations aimed at guaranteeing pluralism, and this can prove an obstacle to the harmonization of legislation.

Another question still outstanding is that of the enforcement of the legislation. The new communication technologies lend themselves more readily than any other technologies to circumvention of the law, and the growth of computer and video piracy is the best illustration of that fact. Moreover, the forthcoming increase in the reception of programmes from direct broadcasting satellites will drive breaches in the control exercised by national jurisdictions. There are already many instances of the failure of commercial television channels to comply with domestic legislation governing advertising and national programme quotas such as exist in the countries of Western Europe, and this bending of the rules is partly connected with the pressure of competition and the increased demand for programmes.

Lastly, the development of communication networks is increasing the interdependence of nations and poses, in the long run, the basic question of the deterritorialization of communication. The new technologies therefore present considerable challenges and involve issues of national sovereignty, security, safeguarding of economic interests and protection of individual freedoms. International legal instruments are gradually being adopted and are starting to fill the gaps in the existing legislation when new technologies are launched, but the whole range of problems has by no means been tackled and there are still many subjects to be studied.

The international communication situation is extremely unstable at the moment, but one salient trend to be noted is the pre-eminence of a new style of industrial and commercial thinking about communication circuits. This situation calls for concerted international action on a broad scale, so that it will be possible to maintain a balance between regions, safeguard the poorer countries' right to information, and ensure respect for the fundamental principles of international co-operation. It is essential, therefore, for legal studies on this subject to be carried further, so that they can assist in defining and resolving the issues involved.

Chapter V

The cultural issues involved in the new communication technologies

The mass media have a wide variety of effects on culture and these represent a considerable body of research on international communication. At the present time, the vast number of programmes on offer and the increased scope of reception facilities connected with the development of new technologies such as satellites and video are responsible for the accelerated growth of international flows of audio-visual products and are creating a new situation which calls for investigation.

Since the 1970s, researchers have taken a keen interest in the circulation of communication materials. The imbalance in exchanges of cultural goods from North to South has been highlighted by empirical studies, whose findings have, among other things, fuelled the debate on the New World Information and Communication Order.

The overwhelming proportion of materials of Western origin in these international exchanges raises fundamental questions regarding their impact on national cultures. The dissemination of these products in most of the regions of the world has been seen as being a factor in the levelling-out of cultures and as a threat to the preservation of endogenous cultures in particular. But communication technologies also give rise to the emergence of new and as yet not clearly understood forms of culture which are being created through the interaction of tradition and modernity, and these need to be studied.

Furthermore, the subject of technology transfers lends itself to research ranging over a variety of technical, economic, cultural or sociopolitical problem areas. In this connection, the cultural standpoint occupies pride of place, since it makes it possible to study technology transfers on the basis of the local context in which they are situated and to take account of the socio-cultural parameters on which the success of their application depends.

A new look at 'cultural imperialism'

The cultural challenges presented by international communication have been analysed on the basis of the study of the communication flows of mass communication products between the world's different regions. Two wide-ranging quantitative surveys carried out with Unesco's assistance, one in 1972-1973 and the other in 1983, enabled a comprehensive assessment to be made of the international circulation of information programmes and television broadcasts. The findings of these surveys are now well-known, but it is nevertheless important for their main features to be briefly recalled.

The 1983 survey confirmed the main findings of the data collected ten years earlier. The dominant pattern of international exchanges in the television sector is still from the main exporting countries to the rest of the world. The bulk of imported programmes comes from the United States and, to a lesser degree, from Western Europe and Japan (above all of cartoons in the latter case).

There is no question that the overwhelming proportion of programmes involved in transnational flows are made in the United States. In 1983, for instance, these programmes accounted for more than 40% of those imported into Western Europe and three-quarters of those in the countries covered by the study on Latin America. In the six African countries studied, most of the programmes imported came from the Northern hemisphere, chiefly from the United States and the United Kingdom.

However, the 1983 survey points to a significant trend, which is bound up with the development of regional exchanges via satellite. These exchanges represent a well-established tradition in the countries of Western and Eastern Europe, where more than 40% of the foreign programmes broadcast come from those regions. In addition, one-third of the programmes imported by the Arab States come from their own region, whereas only 10% of the programmes imported by the countries of Latin America are produced there.

In spite of the growth of regional exchanges, the current situation is characterized by the continuing existence of the main disparities in the quantity and origin of the flows between nations and regions. For instance, the imbalance between North and South is coupled with the gap between East and West in that, while the countries of Eastern Europe import more than two thirds of their foreign programmes from the non-Socialist countries, the Western European countries obtain only 3% of theirs from the Socialist countries.

Flows in respect of films are no exception to this dominant pattern. On the international market, in spite of the high level of production of films in Asia (India and Japan are the world's leading producers in terms of the number of films), American films, followed by films from Western Europe, account for more than 80% of the films purchased by the non-Socialist countries. Asian films are seldom seen by other than national or regional audiences.

The main trends cited here are also found in exchanges of news. These are still in the hands of the international agencies which supply, among other things, the bulk of the information on the developing countries. Some progress has been made in the regional circulation of news, especially in the Caribbean, the Arab States and Asia, where the Asian Broadcasting Union (ABU) has fostered televised exchanges. By and large, however, international flows of news follow the model set by audio-visual programmes.

Another study carried out with Unesco's assistance examined the coverage of international news by the daily press and information bulletins on radio and television in 29 countries in different parts of the world. The findings show that there is roughly the same coverage of international news and that the regional factor is an important criterion in selecting foreign news broadcast on all national media. The second finding lies in the importance attached to information on the United States and Western Europe.

The 'hot points' of international news come in third position. Little attention is paid to the regions of the Third World that are not the scene of important events or to the countries of Eastern Europe. The national press agencies and special correspondents are the main source of news on foreign countries, followed by the main international press agencies. This finding demonstrates the functions which national press agencies perform in selecting, interpreting and treating foreign news, which they generally take from the dispatches of the main international agencies. The information from the press agency pool of the non-aligned countries and from regional agencies occupies a secondary place in the coverage of international news in the countries surveyed, including the developing countries. This finding confirms the predominant position held by the main international press agencies which, by virtue of their size and the quality of their network of correspondents and their tradition of professionalism, are for the moment assured of occupying the leading place in supplying information on international current events.

Entertainment programmes still occupy a privileged place in the circulation of audio-visual materials. In 1984, Unesco launched a specific study on international flows of fiction programmes, based on a survey carried out in 13 countries in North America, Latin America, Europe and Asia. The findings show that while the United States is the largest importer of programmes in volume terms, the materials it imports account for only 13% of all the fiction programmes shown on the television networks. In all the other countries covered by the survey, the number of foreign television plays shown is higher than national television drama and this proportion even amounts to more than 80% in the developing countries surveyed, as well as in one small European country (Denmark).

A number of large Latin American communication groups can also be seen to have made their appearance on the international television programme market. For example, two-thirds of the output of the Televisa group in Mexico are intended for export to the region and the world at large, while the Globo conglomerate in Brazil has succeeded in penetrating not only the South America market but that of Western Europe as well. This group primarily exports *telenovelas*, as well as music and sporting programmes, to 128 countries.

Nowadays, the growth in the supply of television programmes generated by the increase in the number of networks, which is bound up with the movement towards deregulation, is clearly having an effect on international flows. In Europe in particular, the competition between channels, in their bid to attract audiences, together with the need to have a large stock of programmes available, are fostering imports of American series that have already covered their production costs on the huge American market and are therefore accessible in other countries at an unbeatable price compared with the budgets needed to produce national programmes. In other regions of the world, however, the competition between television stations is also contributing to the import of American programmes. These are very popular among the public and are sold in the developing countries on very advantageous terms, as researchers have shown in the case of Nigeria.

Direct broadcasting satellites are also bound to have an effect on television flows and Western programmes that can be picked up with small dish aerials are already being received in some regions, including the Caribbean and the Maghreb.

Video offers another international distribution circuit for audiovisual materials, although this is more difficult to evaluate in terms of figures, owing to the large number of illegal products in circulation all over the world. However, a study carried out by Unesco on the video situation in 26 countries offers some pointers which enable the overall pattern of the flows to be grasped.

The world videogram market is largely dominated by production companies from the industrialized countries, and especially from the United States. In most countries, video films are chiefly imported. For instance, 75% of the titles available in Spain and 96% of those in Australia (more than 60% of them American) are imported, while in Brazil 80% of all video films are either American or European. Films reproduced on cassette originating from Egypt, India or the Asian countries are also carving out a sizeable share of the market for themselves in their respective cultural regions.

In terms of their content, the videograms are chiefly intended for entertainment and cover a number of main categories, including adventure or action films, films of violence, cartoons and pornography. The production and consumption of videograms catering for special interests, such as hobbies and sport, seems to be quite marginal. Hence, according to the findings of the studies carried out, video is contributing to the strengthening of transnational communication flows and to the growth in the consumption of materials for entertainment purposes.

The new forms of audio-visual materials on offer and the growing demand for images in most of the regions of the world are accordingly raising research issues and call for an updating of the data on international flows.

Another aspect of developments in transnational audio-visual production is the international tendency for cultural materials to become standardized and homogenized. Indeed, the preponderant place occupied by American series and films in a large part of the world is resulting in the worldwide adoption of their production standards.

The international success of American fiction materials has been the occasion of a number of studies, some of which have been commissioned by Unesco. Researchers have looked into the reasons for their enormous popularity. It is a fact that the way in which those products are marketed and their availability at low cost represent a decisive factor in the worldwide dissemination of American fiction productions. The studies show that, contrary to the generally accepted view, these programmes are not sold at dumping prices on account of their cost having already been recouped on the huge American market. In fact, the sales conditions vary with the purchasing countries and are fixed in terms of economies of scale. The findings of the research also look into other features of American programmes which may account for their popularity. It is true that the technical perfection and professionalism associated with the Hollywood tradition is based on highly sophisticated facilities and very substantial financial resources. Yet the sophistication of the production system is coupled with an almost craft-like creative process and, in fact, American fiction productions are first visualized in the 'backroom' by small teams of producers, who imagine how the series will turn out as the series proceeds, as has been demonstrated by the work done on the celebrated series 'Dallas'.

Research has also been done on analysing the content of American programmes, in which the focus is placed on universal values that are likely to spark off the interest of viewers belonging to differing cultural environments. The multi-ethnic and multiracial dimension of American society subtends the very general approach taken to such themes as adventure, conflict, social advancement and the clash between 'good' and 'evil' and, in that sense, the American market represents a sort of 'living laboratory' for the international audience and a test for the export of fiction productions. Research has therefore established a link between the universal content of American programmes and their popularity all over the world.

Owing to their success, American fiction productions, and especially American series and soap operas, have a direct influence on the production standards of other national television systems.

For example, the current high level of production of Latin American *telenovelas* draws its inspiration, to some extent, from the example set by the United States. The research sees them as having the same technical and artistic quality, but the *telenovelas* differ significantly from the American fiction productions in their treatment of time and their narrative structure. Although the format is identical, it is possible to see in them the representation of endogenous cultural forms.

The American production format is tending to become the norm all over the world. The European television systems in particular, concerned as they are at increasing their audiences and exporting their programmes, are increasingly copying the example set on the other side of the Atlantic. For example, French television, which has a TV drama tradition of a high aesthetic standard and a cultural historical series, has produced a family saga that is largely an imitation of the Dallas serial. This trend is spreading not only to fiction: variety programmes are turning more and more into replicas of the leading American music shows.

A sort of *de facto* universalization of the American production norm is taking place, as a result of which the tendency is for programmes to become much the same and increasingly standardized throughout the world. The abundance of products on offer is accordingly accompanied by a pattern of uniformization which, according to the studies made, is liable to become even more marked as communication groups continue to merge.

The emergence of new forms of culture

The impact of transnational audio-visual products on the cultures of other regions has spawned a vast literature, which has denounced the risks of cultural identities disintegrating and of the world's cultural traditions losing their diversity.

Stress has been laid on the dissemination of a model of society based on the values of materialism and consumerism that are inconsistent with the moral and spiritual values of many societies. Exported programmes are liable to have untoward effects, such as by prompting people to aspire after the acquisition of consumer goods and personal success, which affect the norms dictating the welfare of the community that are at the very foundation of some traditional societies. Moreover, the high proportion of films of violence shown is increasingly setting a bad example for young people in particular.

The consumption of these products also has an influence on the shaping of viewers' taste to Western production models. Local television products, made with the limited resources of the developing countries, look poor by comparison and are neglected in favour of foreign films and videograms.

These general findings have often been based on studies covering programme contents and on the figures recorded for international flows of cultural products. Research of this type is most useful, but it does not make it possible to pinpoint the real effects of Western programmes on other cultures, which can only be ascertained through an ethnographic-type approach.

Empirical studies among people at the receiving end in different regions of the world started to be developed in the course of the last decade, although they are still few in number. The best known and most rewarding of these consisted of the research done on the Dallas series. In spite of the wide range of theoretical and methodological frameworks, the findings of these studies show that this family

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saga, which has had considerable international success, except in Japan and some of the countries of Latin America such as Brazil, was perceived in different ways, depending on the ethnic and cultural environment.

The subjects arousing viewer interest in this drama series vary from one culture to another. Family problems are interpreted in the light of the norms of the culture of origin, as was shown by a survey conducted among 55 discussion groups composed, on the one hand, of Americans from Los Angeles and, on the other, of four ethnic groups from the urban area of Jerusalem. In addition, the psychological factors which predispose people to be attracted by this series turn out to be different in countries which, at first sight, might be expected to share similar cultures, like the Netherlands and the Federal Republic of Germany. The study of the way Dallas was received in Algeria showed that, far from regarding it as an apologia for modern capitalism, the people interviewed saw the message as being the destruction of the roots of the extended family, striking directly at their own cultural traditions.

This very brief summary of some of the research underscores the active role of the people at the receiving end in media consumption. The Dallas series gives rise to different decoding processes according to the culture involved, and these call into question the idea of its being perceived in the same way everywhere. Hence, the supposedly hegemonic message is subjected to a variety of 'critical readings', since the different ethnic groups comment on the content of the programme on the basis of a matrix supplied by their own reference systems, whose validity they defend in relation to the values of American society.

This research queries many assertions regarding the uniform impact and, indeed,'manipulative' character of Western programmes on local cultures. Nevertheless, it has limitations that are inherent in the approach it takes. The study of the reception and perception of a single programme dispenses with the need to engage in an analysis of a broader impact bound up with the consumption of large quantities of exogenous cultural projects. It is true that the dissemination of Western values through constant exposure to a variety of media is probably not consistent with the determinist and reductive stimulus-response scheme of things. But that impact can no longer be underestimated. It takes a multiplicity of forms and is highly complex. The large number of effects, regardless of whether they take the form of mimicry, resistance, rejection, alienation, partial acquiescence, and so on, bring into play processes of interaction between the values of tradition and modernity, and these give rise to hybrid and constantly evolving cultural references.

Research on the impact of the dissemination of a worldwide culture accordingly requires long-term qualitative studies geared to obtaining a close understanding of its effects on the values, norms and codes of ethics of different societies. This approach entails engaging in far-reaching ethnographical studies and records of observations based on a deep knowledge of local cultures.

No matter how valid it may be, the work done on 'cultural imperialism' has, until quite recently, underestimated or even disregarded the dynamic nature of social systems and local cultures. The transnationalization of culture is admittedly a fact of life, but it is also accompanied by the permanence of certain traditional cultures. For instance, the success of Egyptian and Indian films in their respective culture areas bears witness to the interest which the public continues to display in products drawing their inspiration from its traditions. In Europe, national television dramas attract high viewer ratings. In India, three-quarters of the video films are endogenous products in Hindi. Similarly, in some countries, like Japan, videograms of popular music and culture are widely available on the market. According to one survey, Maghreb audiences prefer Arab music to its Western counterpart. Again, African music is still very much alive. In the Caribbean, in spite of the massive import of Western products, the regional programmes of the Caribbean Broadcasting Union are much appreciated by television viewers.

The fact is that high-quality regional culture programmes are popular with audiences all over the world. The success of imported programmes seems to be more closely connected with the shortcomings of national production systems, which are unable to fill the television broadcasting schedules with attractive products, owing to the unduly high production costs compared with the budgets they are allocated, the fact that the markets are too small for them to recoup their costs, the deficiencies of the industrial production machinery, and so on. The interest shown in foreign programmes therefore appears to bear a correlation to the weaknesses of endogenous production and to the failure to give priority to cultural policy in many countries that are having to contend with a host of structural development problems.

Furthermore, language barriers are still an impediment to the penetration of transnational products, even in Europe, where studies have shown the very low viewing rates for programmes in English on the cable channels of the French-speaking regions. The hegemonic view of things is therefore offset by the allowance that has to be made for sociological factors, which enable the finer shades of significance to be brought out.

Even so, the cultural resources of the world's different regions are gradually being caught up in the industrialization of culture, which is also spreading in the countries of the South and is liable to be prejudicial to live performances. Reproduction techniques on technical media such as video cassettes and records are becoming more and more widespread and the commercialization of endogenous forms of cultural expression is gradually taking over. Some of these forms are now to be found all over the world. For example, the music of the Caribbean region and Africa has become world-renowned as a result of the recordings of a number of orchestras and singers produced by multinational groups. These products combine talents which have their roots in traditional cultures with industrial manufacturing and transnational marketing techniques. Their success and influence on the culture of young people in the industrialized countries is also a question for research.

The cultures of the different regions of the world are currently undergoing far-reaching changes, even in the in-

dustrialized countries, but these are still difficult to identify and analyse.

These changes are taking place against a background of economic and technical transformations which are affecting the international circulation of cultural products. On a worldwide scale, the superabundant supply of audio-visual programmes is catering for a growing demand and is accompanied by a tendency for the pace of industrial production to be stepped up, for contents to become uniform and for products to decline in variety. In addition, the new technologies are significantly increasing the means available for disseminating these standardized materials throughout the world, while direct satellite broadcasting is heralding the even deeper penetration of these products beyond national frontiers. These facts are fuelling the debate on the risks of universalization of culture.

The analysis of cultural phenomena also involves new problem areas, since the effects of the new technologies are by their nature complex and multi-dimensional. Firstly, the studies have often been merely content with evaluating their effects on the basis of analyses superimposed on the oneway flow of media products, since endogenous cultures are considered *a priori* only as being amenable and defenceless dumping grounds for them. Secondly, as a result of the concern shown for preserving local traditions, the dynamic nature of societies has been neglected, yet their cultures are not set in a hard and fast mould but are still, by their very essence, alive and evolving. The creativity and autonomy of endogenous cultures remain virtually unexplored. It is now necessary to reconnoitre and study them, in order to obtain a clearer grasp of the effects of the dissemination of a worldwide media culture and the responses that have to be made to this factor in different societies.

What is more, communication research has still scarcely looked into the emergence of new forms of culture which are arising out of the interpenetration of tradition and modernity and which bring into play highly elaborate factors involving opposition, negotiation, co-existence and blending. This interaction is generating unprecedented attitudes, values and behaviour patterns and is having its effect on cultural identities.

The transnationalization of culture is riddled with contradictions. Some main patterns can be identified, but the ways in which they are perceived and the forms of cultural evolution to which they are giving rise is a territory that has yet to be cleared.

Cultural assimilation of the new technologies

The new technologies are opening up a new field for technology transfers. It is true that they are still largely concentrated in the advanced industrialized countries which make up the bulk of the world market, but they are also gradually penetrating into other regions of the world that are starting to fit themselves out with the latest technology in the telecommunications, informatics and audio-visual sectors.

The developing countries' awareness of the broadening gap separating them from the countries of the North is a factor underlying their aspiration to acquire the new technologies, which they regard as being a means of catching up and as a symbol of modernity. The new technologies afford an opportunity for taking a second look at development models and are regarded as a potential means of making a technological leap forward and of gaining direct access to the 'information society', whose rhetoric has spread to the different regions of the world. The specific features of these tools, such as the miniaturization of hardware, especially in informatics, and the reduced purchasing price, are looked upon as important assets which all the more justify their being adopted by the poor countries.

The new technologies also afford an opportunity of reviving the causal determinist model whereby technology in itself is seen as a source of economic growth, although this model has been largely queried by a large number of studies dealing with the more traditional technologies.

Research on the transfer of the new technologies also confirms the failure of technically-oriented approaches, which are sparing in their analysis of the specific problems of the developing countries and of the adaptation of hardware to local contexts. The success of the transfers depends on adopting an approach based on a tangible grasp of the issues to be resolved, which have to be formulated in terms of existing local resources and specific cultural situations.

The current development of technology is giving rise to increased interdependence on an international scale. National independence is becoming a relative consideration in all countries, including those of the North, since the new technologies often include built-in features manufactured in other countries. However, this trend has to be distinguished from the question of transfers, which involves regions that have no control over the technology. The research carried out on transfers raises a large number of problems, among which factors of dependence prove to be crucial. Indeed, endogenous equipment production policies, such as have been adopted by some of the industrializing countries like India and Brazil, are an illustration of the concern shown for breaking with this model by taking over full control of the processes involved in manufacturing and introducing technology. However, the deliberate adoption of such policies is not within the means of many countries, which find themselves in situations where they have to import the whole range of exogenous technology packages, including equipment, directions for use, operating processes and end uses.

The ways in which the technology is transferred varies with the projects and countries involved. At the equipment manufacturing level, the transfers are usually confined to delegating the task of assembling and erecting it, which generally goes by the name of 'screwdriver technology', whereby the multinationals profit by the cheap labour of the developing countries. However, the progress made in automating production in the countries of the North are now calling into question this international division of labour.

In the telecommunications and audio-visual sectors, technology transfers frequently take place in accordance

with the conventional 'turnkey' model, on which there have been a large number of studies. Typical examples of this include radio and television stations and telecommunications and land-based or satellite networks. The equipment is often installed under all-inclusive contracts with multinational communication companies, which import and erect the equipment and supply spare parts. The transfers are confined to training local personnel and to laying down specifications for operating and servicing the equipment selected. The manner in which such transfers are conducted creates captive markets, and hence ties of dependence. Moreover, imported technologies sometimes turn out to be unsuitable, owing to the failure to engage in prior studies on the communication requirements of the purchaser countries and on its future uses. After having been installed, the technical infrastructure is therefore not used to full capacity, because the package has taken precedence over the content and the technology over the product itself. The case of the Arabsat satellite, among others, is symptomatic of the straightforward import of exogenous technology, in which the local operating conditions and the needs of this regional co-operation project were disregarded.

Research has also looked into the conditions for negotiating technology transfers and into the decision-making processes involved. The parties to such deals, consisting of local decision-makers and the multinationals, have differing interests, and the development goals of the former are not always consistent with the market growth objectives of the latter. The negotiations are often complex and give rise to attempts by the different prospective suppliers to outbid one another in the packages they offer, which may include payment facilities, grants and training assistance programmes. In such negotiations, economic and political factors often outweigh proper consideration of the actual needs. The terms of the deal are unfavourable to the local parties, whose negotiating capacity is handicapped by the lack of local expertise and of a decision-making strategy, as has been notably shown by the research done on the programme for providing the Andean countries with colour television. The failure to define the problem to be solved beforehand and the lack of consistent policies for the development of technology results in equipment being blithely imported without any transfer of knowledge or any endogenous applications.

Technology transfers in informatics also usually conform to the same pattern of dependence. The transplantation to the countries of the South of informatics systems designed for the needs of the countries of the North demonstrates the failure of the technology on offer to cater for the problems of development. The structural constraints detract from the effectiveness of the transfer, which has to contend with the weakness of national markets and industrial density, the shortcomings of the telecommunications and power supply facilities, and the geo-physical conditions, such as the climate and dust, which entail adapting the equipment specifically to the purpose required of it and ensuring constant maintenance, both of which add to costs. The shortage of skilled informatics personnel, such as engineers, technicians and programmers, and of trained users also reduces the operating potential of informatics systems and contributes to the continuing dependence on the supplier countries. Imported software is often unsuited to national needs and to solving the specific problems faced by different developing countries. In addition, those countries do not have the capability to set up their own data banks and hence they are confined to playing the role of end-users of such services, which are concentrated in the North. In the bulk of cases, informatics technology is still an exogenous product, with the exception of those countries that are endeavouring to make that technology their own by adopting a policy aimed at encouraging the creation of a domestic hardware or software industry and at developing a national informatics engineering and services capability.

In some instances, the spread of micro-informatics is resulting in the uncontrolled import of hardware in some of the countries of the South, since its relatively low cost, the limited size of the configurations and the ease with which it can be used all offer undoubted advantages which prompt people to acquire such equipment. Yet micro-computers are not proving to be the technological answer to development problems either, and their applications are also inhibited by the lack of suitable software and trained users. For example, China's massive imports of micro-computers have not had the effects expected and many of them have stood idle on account of the lack of skilled personnel and suitable programmes. The applications of micro-informatics belie the myth that it is easy to use, since it calls for a technological acculturation that is often lacking in the countries of the South.

Furthermore, the experiments conducted on teleports — advanced telecommunications zones with dense high-tech concentrations — have become widespread in the industrialized countries and are now appearing in the developing countries. Teleports are based on the optimistic premise that they can act as a springboard for industrialization, although their multiplier effects in the South are still by no means certain and call for study.

The research done on transfers of the new technologies underscores the problems raised by the adoption of a purely technological approach. The high cost of advanced technologies is instrumental in adding to the burden of indebtedness of the countries of the South and often works out to be higher than the initial projections, owing to the fact that programme production and personnel training budgets are underestimated. Priority is often given to hardware to the detriment of software, in the form of programmes, audiovisual products, telecommunications flows, and so on, which ultimately turn out to be the decisive factor in operating the technology. According to the studies carried out, the development of manpower resources appears to be the main factor in the success of technology transfers and the prerequisite for mastering the equipment and ensuring endogenous production.

The research findings demonstrate the importance of adopting an approach geared to problem-solving rather than to technology alone. Technology in itself is powerless to cope with the problems of development. Prior analysis of the social and human factors dictates the way in which the equipment should be adapted to the local context and the

technology appropriated by the population, in other words how it should be integrated into the social fabric. Development problems are by their nature economic, social, political and cultural, and technology is only one means, among others, of remedying them, rather than being a cure for all ills.

The new technologies should not be reduced to the status of a mere piece of equipment: they are complex packages bringing into play a host of social, cultural and economic factors. Hence, technology transfers form part of a specific process of cultural appropriation, which dictates whether they will be successful or not.

Studies have pointed to the relevance of pragmatic policies based on a concern for adopting technology to local needs. The technology-inspired utopia is giving way to approaches that are less ambitious but more realistic. Projects undertaken through such an approach set out by defining the basic problems and endeavour to find appropriate technological answers and, in so doing, reverse the pattern of transplantation and *a posteriori* adaptation, which often turns out to be ineffective.

According to the studies carried out, the examples set by appropriate technology, such as the use of solar energy, low-power transmitters, and so on, represent forms of transfers which blend with the needs and means of the countries of the South. Yet advanced technologies may also be suited to specific forms of acculturation.

For example, Unesco's computer-assisted publication (CAP) project for the production of rural newspapers in Africa is based on the design of a specific software through the adaptation of the African reference alphabet, AFRALPHA, which was developed with the Organization's assistance. The production of a set of character fonts that can be used in all African languages is making it possible to develop micro-publishing, whose efficiency and low cost make it an attractive proposition for the publication of reading materials for literacy and post-literacy purposes. The project also provides for specialized training in micro-publishing. The African alphabet software is made available to the Member States for use by writers, educators and journalists, and is compatible with the different CAP word-processing configurations. For the moment, six languages have been adapted to the use of the software. Micro-publishing is therefore being enrolled in the service of African languages, and the technology involved is catering for the aims of development and cultural integration.

The international organizations have an important role to play in promoting appropriate technologies, and the complex nature of the transfers involved calls for co-ordination between them. In addition, owing to their intersectoral nature, many projects entail ensuring that the action taken under a variety of domestic programmes is consistent. In Unesco, for example, in addition to communication proper, the new communication technologies impinge on the areas of information, science, informatics, education and culture. When transfer processes are being worked out, it is necessary to capitalize on the experiments conducted by setting up files on the studies carried out, analysing their findings and circulating information on them among the Member States.

The studies also show the as yet hesitant emergence of new forms of negotiation between the parties in North and South. Development incentives taking the form of grants and sundry other forms of assistance for the procurement of technology have been seen to give rise to situations of dependence. In acknowledging these constraints, the parties in the poor countries are being prompted to proceed with caution and to build up their own negotiating capability. Although this development is still on a modest scale, it is giving rise in some places to the formulation of coherent policies at the national or regional level. The efforts accomplished in this direction call for studies capable of gauging the tangible impact which they are having on the conditions and practical application of technology transfers.

The appropriation of the new technologies involves the acquisition of a wide variety of knowledge and know-how, ranging from the design stage right through to the end use. According to the studies carried out, the development of human resources is the prerequisite for the adaptation of the tools of technology to local needs. Moreover, the promotion of action-oriented research at the different stages in the transfer process, such as the definition of the problems involved, project design, production, operation and evaluation, appears to be a crucial factor in ensuring its effective acculturation.

Chapter VI

The new technologies in education

For some years now, the field of education has gone through a series of innovations that are being blended in with the arrival of the new information and communication technologies. These technologies are giving a definite shape to a host of expectations and are often viewed as being a means of reforming traditional education systems and as a tool for adapting to the growth in the demand for training and to developments in the world of work.

Informatics, telematics, tele- and audio-conferencing, electronic messages, data banks, video recorders and videodiscs, among others, are all technologies that are paving the way, alongside the traditional mass media of radio and television, for new educational applications. The increasing variety of interactive facilities is stepping up the scope for self-learning, while the new information transmission networks are completely changing the methods of distance education.

At the present time, these innovations are primarily widespread in the countries of the North, but they are also starting to appear in other regions of the world. Teaching of informatics and through informatics, in particular, is becoming a subject of concern for many countries.

In addition, the important place which the media and the new technologies have come to occupy in societies raises the question of the technical and social control of these facilities by the individual. Knowledge of the operating principles of information technologies and the adoption of a critical attitude towards their use are gradually being established as a subject of study and practice in both formal and non-formal education.

Media education

Media education is based on recognition of the growing part played by information technologies in the lives of young people. According to an estimate made in the *World Communication Report*, school-age children in the industrialized countries are said to be exposed to the mass media for about 30 hours a week — most of them taken up with consuming television — in other words, more time than they spend at school. It can be assumed that the situation is much the same among the young urban population in the middle and upper classes of the developing countries. The prime role played by the media among children and young people, whether it be television, video, radio, sound recordings or magazines, has prompted some countries to set up specific media education programmes. In addition, micro-computers have become the craze among young people in families with such facilities.

An international symposium on the subject, held in Grünwald in the Federal Republic of Germany in 1982, defined the objectives of media education. Such education is expected to include the acquisition of knowledge, skills and attitudes which will encourage the growth of critical awareness in using the media. The training should include the analysis of media and their products and the use of media as a means of creative expression and of participation in the means of communication. Media education therefore includes a reflexive and theoretical dimension and a practical dimension for working with the tools of communication.

At the international level, according to a study carried out by Unesco, media education is characterized by a varied range of programmes and differing ways of using them. The first finding is that there is a considerable disparity between regions; this type of programme has been developed in various industrialized countries and in some of the developing regions, such as Asia and Latin America, but it has not yet really made an appearance in the Arab States or in Africa.

As a rule, the initiative for media education comes from a variety of sources. In addition to the part played by formal educational institutions, a large number of actions are undertaken with the assistance of different participants, such as associations, non-governmental organizations, international organizations like Unesco, or press or audio-visual agencies. In some cases, parents are involved in the implementation of the projects.

Even so, with the exception of countries like Austria, the United Kingdom and Norway, these programmes seldom tie in with the training policies laid down at the national level. Depending on the case, media education is integrated either into the formal education system or else into the nonformal system by means of workshops or study

courses for young people. These two types of training may also exist side-by-side. The trend in recent years has rather been for it to be incorporated into the school curriculum. However, the approach varies from country to country. In the United Kingdom and the United States, for example, media education is a subject that is taught in some primary schools and is continued into secondary education. In Australia, some States have set up large-scale media education programmes throughout the school system, but other States in the country have not followed the same lead.

As a general practice, media education is primarily taught in secondary schools as a subject linked to the arts and human sciences streams. Stress may be laid, as in the case of the Federal Republic of Germany, on the sociological analysis of communication systems and on the critical examination of messages in the arts teaching tradition. Media analysis may also include an aesthetic dimension, as in France, where encouragement has primarily been given to the creation of practical workshops for teaching young people to make films, videos and newspapers. This introduction to media techniques can also be found in school systems in other countries, the aim being to take a practical approach to the analysis of message production.

In Latin America, media education stems from the tradition of participatory communication using 'small media' to foster consciousness raising. For example, the Latin American Secretariat of the International Catholic Organisation for Cinema and Audiovisual (OCIC) has co-ordinated a television and cinema education programme for the children in schools in seven countries: Bolivia, Brazil, Colombia, the Dominican Republic, Paraguay, Peru and Uruguay. This programme trains teachers, who then have the task of introducing children to a critical reading of the media and to making audiovisual products. It has proved possible to carry out various such projects with children in poor urban areas in the countries covered by this programme.

In India, media education programmes have been developed in the form of out-of-school activities for secondary-school children, but plans have also been laid for offering this education as an optional subject in the formal education system.

The fact is that media education does not yet seem to have acquired a precise status in most countries. In those cases where it exists, it appears to be concentrated in the arts streams of secondary schools, and even then it is generally an optional subject. This training often also has to contend with the lack of teaching materials and other facilities for practical courses, as well as inadequate guidance, since teachers have generally not had much training in communication technologies.

In addition, in most cases media education seems to be distinct from courses providing an introduction to informatics. In many industrialized countries, apart from formal instruction in informatics, the practice is for informatics clubs or workshops to be created in schools, where young people can play computer games or learn programming. However, these activities seldom include instruction on how to engage in a critical analysis of the new technologies.

The fact that information technologies are complementary to one another is seldom broached, and media education continues to be regarded as a subject belonging to the arts stream, while the new technologies come under the science subjects. This distinction can probably be explained by the dead-weight of tradition, since the mass media are assimilated to culture and the human sciences, as opposed to informatics, which belongs to technology and the exact sciences.

Yet the development of the analytical and logical skills employed in informatics and the reflective and imaginative faculties aroused by images and sound appear to be complementary factors in the self-development of human beings.

These two worlds are, in fact, moving closer together and the new audiovisual occupations, for example, are coming increasingly to borrow from such informatics technologies as keyboard drafting, desk-top publishing, electronic editing, optical graphics and synthetic images and sound.

Media education is now having to contend with the challenge of the new technologies. The shaping of a critical cast of mind and a general responsiveness to the processes involved in communication has to encompass the analysis of the new communication systems. It therefore appears necessary to decompartmentalize the introduction to information technologies, so that young people who have opted for an arts or science education can benefit from the knowledge and analytical tools needed for them to understand the changes occurring in their environment and can play an active part in them.

The development of the teaching of information technologies entails the creation of teaching aids. Various projects for international co-operation encouraged by Unesco have embarked on the production and exchange of teaching materials geared to the different cultural contexts. Projects for training trainers are still an absolute priority.

There have been very few studies in this area. However, research appears necessary for drawing up project development strategies in the formal or nonformal educational context, designing and defining programme contents and developing training methods suited to the different cultural environments. Lastly, evaluation studies are needed to measure the effectiveness of these programmes in developing the analytical skills of young people and their grasp of communication systems.

Informatics and education

The introduction of informatics into the educational process is a question in which the international community has been showing an interest for a number of years now. It is a vast area, which has formed the subject of a large number of studies, meetings between specialists and scientific and policy debates.

In many societies, the computer and, more specifically, the microcomputer, has become the symbol of the modernization of education and of the preparation of the up-and-coming generations for their entry into the 'information

society'. The case made out for the penetration of informatics into education systems is usually based on the prediction that, in the long run, the structure of employment will change and will involve a marked growth in the tertiary sector consisting of jobs connected with the production, processing and use of information and requiring a command of the new technologies.

In addition to economic considerations, there are other arguments that are more closely bound up with educational processes. There is a considerable body of literature which has seen the 'informatics revolution' as representing a means of radically reforming the education system and which has held out high expectations about the positive effects of the computer on cognitive processes and personality development. The experiments conducted in this field now make it possible to have a more qualified view of things, even though there are still not sufficient data nor the depth of perspective necessary to gain a clear picture of the effects of introducing informatics into education.

Computers in schools already have a history behind them. Informatics as a subject made its appearance some twenty or thirty years ago in universities and institutes of technology. It was only introduced at a later stage into the higher classes of the general or specialized secondary education system. Indeed, it was only in the 1980s that it also appeared in the lower classes of secondary schools or even in primary schools, although that practice was only adopted in some countries.

At the world level, a document published by Unesco in 1986 showed, from the findings of a survey, that 43 countries had embarked on large or smallscale projects based on computer applications in secondary or primary schools.

The situation worldwide is characterized by significant disparities between countries. In 1988, it was globally estimated that there were one million micro-computers in the schools of the European Community and that the figure was higher in schools in the United States. A recent Unesco survey, whose findings have not yet been fully processed, confirms the wide variety of situations in individual countries, whereby the number of computers installed in schools ranges from a few dozen to about one hundred thousand, according to the figures obtained from a limited sample of 37 countries, which did not include countries with most such facilities.

The introduction of informatics into education is giving rise to a variety of different policies, depending on the aims being pursued and the resources available. The Fourth Conference of Ministers of Education of the Member States of the Europe Region (Minedeurope IV), which was held at Unesco Headquarters in 1988, noted that the strategies differed from country to country and that some of them gave preference to teaching informatics at the technical and vocational training level, while others adopted policies for introducing the subject into the general education system, sometimes from primary school onwards.

Although the ways in which computers are introduced may differ, all the European countries can be seen to have taken steps aimed at training young people in informatics. Some countries have elected to fit out schools on a massive scale and have adopted national projects for that purpose, such as the Informatica Stimulerings Plan (INSP) in the Netherlands and the Microelectronics Programme in the United Kingdom. In France, the 'Informatique pour tous' Plan introduced in 1985 has been instrumental in fitting out virtually all educational establishments from the primary to the higher levels and is combined with a programme for training teachers and creating educational software. The three objectives of the Plan are to provide an introduction to informatics, to use the computer as a teaching aid and to adopt informatics as a school subject.

The countries of Eastern Europe have also adopted programmes for developing the teaching of informatics in school. In the Soviet Union, the introduction of informatics represents one of the main lines of thrust of the reform of the education system. Priority is being given, in the first instance, to teaching informatics in the last three years of secondary school, but the fundamentals of programming are taught in the lower classes. A special effort is also being made in specialized secondary schools, with the aim of training programmers and informatics technicians. The goal is to fit out the education sector with more than one million individual computers. In Hungary, a plan has been drawn up whereby it has been possible since 1983 for every secondary school to be equipped with one or more locally manufactured microcomputers. Informatics has been used for teaching mathematics, science and foreign languages, among other subjects.

In Asia, Japan introduced computers into schools only at a late stage, after the problems bound up with adapting informatics programmes to the Japanese language had been solved. By 1985, computers had made their appearance in most of the second-cycle secondary schools and were starting to penetrate into the first cycle and into primary schools. Training for technicians and computer scientists has been provided in the secondary vocational education system of Japan for a long time, but informatics is now also introduced into the general education system. In fact, this project is linked with the study of a more far-reaching reform of the Japanese education system.

A number of developing countries have also adopted plans for informatics in schools. In India, for example, the Class (Computer Literacy and Studies in Schools) project is aimed at introducing secondary-school pupils to informatics. In 1987, there were some 1,250 secondary schools equipped with micro-computers, and the target is to cover 10,000 schools by 1990. Training has been provided for teachers and the project also includes the setting-up of software production centres.

In Latin America, national school computerization projects have been drawn up in several countries, including Mexico, Brazil, Argentina and Cuba. Mexico, for example, has made plans to introduce micro-computers using Mexican software in primary schools and the first cycle of secondary schools. The aim is also to equip public libraries with computers, so as to increasingly familiarize children with information and even to contribute to literacy training. Alongside these government actions, the country has a host of private groups, which have set up experimental informatics workshops for teaching children, and are also engaged in designing educational programmes. In fact, the

production of educational software seems to be a significant activity in several countries in the region.

Failing the existence of national plans, a large number of school informatics projects also exist in the other Latin American countries. These often consist of limited experiments primarily involving private establishments attended by pupils from more privileged environments.

A similar situation exists in Africa, where some countries, like Côte d'Ivoire, have adopted specific policies, while others depend on private initiatives. Even so, informatics is primarily concentrated at the higher educational level in the region.

This very brief review of some of the projects for introducing informatics into the education system points, firstly, to the gap existing between the different regions of the world and, secondly, the wide variety of ways in which computers are being installed.

Informatics caters for different real-life situations, depending on the aims being sought, and the different purposes for which it is used in the school environment need to be spelt out.

The introduction to informatics represents an initial level of training, which covers learning how to handle the computer, a summary knowledge of how it operates and, more generally, familiarization with it as a working tool. It may also include basic training in programming. This is commonly described as computer literacy and is aimed at removing the aura of mystery from the computer and turning it into an everyday object.

Informatics as applied to teaching uses the computer as an educational aid. Stress may be laid on the development of cognitive and mental processes (as in the case of the celebrated Logo software used in primary schools and of simulation software for older pupils) or on the teaching of different subjects, such as mathematics, grammar, foreign languages, informatics, and so on, with computer-assisted teaching (CAT). The use of the computer as a teaching aid makes it possible to individualize the learning process.

Lastly, informatics taught as a subject covers various curricula and levels, including general training in the information sciences, instruction in programming, and high-level science teaching. This form of training is usually provided in general or technical secondary schools and in universities.

These different cases of applications of informatics in education systems have already been the subject of a number of evaluations. One piece of research published by Unesco in 1987 reports on the findings of studies carried out chiefly in the United States, in particular on CAT, which seems to be the sector covered most thoroughly by the research. According to this document, CAT makes it possible to improve pupil performance, but no significant difference was noted compared with other innovative methods. The main beneficiaries are the weaker pupils. The computer is a factor in the motivation to learn on account of its game-playing aspect and its novelty, although this is likely to decline in the course of time. Primary schoolchildren learn better with CAT if they are supervised by a teacher, whereas the opposite is true of secondary schoolchildren. The effectiveness of CAT appears to be bound up with the children's ease of access to computers and the length of time they can use them. Furthermore, the progress recorded tapers off as the instruction goes on. The benefits of CAT are greater in primary school, whereas computer simulation exercises appear to be more effective in secondary school.

The results of experiments based on the use of the Logo software for the development of cognitive skills have proved to be contradictory, and may be positive or negative, depending on the case and the evaluation reports.

The same synoptic study also examines the relationship between the teaching of informatics and the labour market. It notes that the spread of the new technologies calls for the training of a group consisting of informatics professionals, such as programmers, technicians, engineers and high-level scientists. By contrast, most of the jobs in the tertiary sector using the new technologies do not require specific training in informatics or programming. The skills needed to handle informatics facilities can be readily acquired through specific training courses or on-the-job training, as is currently the practice in the advanced industrialized countries. In the case of such jobs, the bulk of the training always seems to consist of acquiring sound basic skills in management, book-keeping, draughtsmanship and typing.

These arguments militate in favour of introducing informatics in technical, vocational and university education, which has more direct effects on employment. They are also instrumental in calling into question the economic case made out for computer literacy at school and its long-term effectiveness in fitting people out for employment. These considerations are intended, in particular, for the guidance of decision-makers in the developing countries, who are having to contend with the difficult problems of choosing what approach to adopt to introducing informatics into education.

The opposite arguments are advanced by other specialists, who regard a general introduction to informatics as being instrumental in familiarizing pupils with the technology, which is a prerequisite for preparing them for their future jobs and for fostering a sense of vocation among people who will go on to make a career of informatics.

The findings of the studies currently available are still of too piecemeal a nature and informatics experiments in schools have not yet reached the critical-mass threshold, in terms of the number of computers, high-quality software and trained teachers, to make it possible to draw conclusions that are capable of general application. Moreover, there are not sufficient data to provide comparative results on the introduction of informatics into schools from differing cultural backgrounds.

The entry of informatics into the general educational process is still a matter of experiment and trial and error, even in the advanced industrialized countries, and this is reason enough for adopting a cautious approach. The findings of the studies carried out already make it possible to identify a number of problems for which due allowance will have to be made.

The availability of high-quality educational software adapted to curricula appears to be a key feature of school computerization policy. However, in most countries, the projects suffer from a shortage of software and the existing

educational packages are often of a poor quality. In fact, according to the studies, good educational software design entails teamwork bringing together a computer scientist, a teacher in the particular subject, a learning specialist and, if possible, an expert in communication, following which all their work has to be edited. This is why the price of high-quality educational software is very high.

Apart from the cost factor, in the developing countries, which have no endogenous software production capacity, the question arises as to the adaptation of the imported educational software to their school programmes and to different language and cultural environments.

Teacher training is also a key factor in the successful introduction of informatics into schools. In the national projects mentioned above, this aspect was taken into account, but in spite of the efforts made, the length of time spent on introducing teachers to informatics is still often too short and is not sufficient for them to be capable and motivated enough to make full use of the computer as a teaching aid, especially since the educational software available is frequently unsuited to their needs. This situation creates feelings of reticence among teachers and results in the computers not being used to their full extent in some schools. Studies show, in fact, that proper use of computers depends on the support of the teachers and that the teacher-pupil relationship is still fundamental.

Informatics in schools accounts for significant added costs, of which the proportion represented by the purchase of hardware is by far the highest. The production of educational software and teacher training are the next highest expenditure items, to which maintenance costs and research and development budgets have to be added.

All these factors militate in favour of adopting consistent policies based on precise goals and on informatics application methods taking account of the different parameters contributing to its effectiveness. At all these levels, research performs a crucial role in project definition, cost-effectiveness analysis, teaching applications and evaluation.

At the international level, a start has already been made to exchanging experiences in this area and to fostering co-operation between countries. Within OECD, the Centre for Educational Research and Innovation (CERI) has reviewed the policies for introducing the new technologies in the education systems of some countries and has launched studies of pilot projects in nursery classes, senior classes and non-formal education. The Council of Nordic Ministers of Education and Culture has undertaken co-operative projects in this field. In Eastern Europe, in 1986, the Council for Mutual Economic Assistance (CMEA) adopted a regional programme for improving the education system by using informatics technology. There is also a co-operative research and development programme for educational innovation in South-Eastern Europe (CODIESEE). The Council of Europe, among others, has encouraged research on the introduction of informatics in primary schools and has held conferences on various aspects of the new technologies as applied to education. The European Community has launched the Delta Programme (Developing European Learning through Technological Advance), which provides for the development of advanced learning technologies and concerted interdisciplinary action on current and future teaching-aid requirements.

In 1989, Unesco organized the First International Congress on 'Education and Informatics', which made it possible to draw up a global inventory of projects in this field and to identify lines of international co-operation in the following sectors: exchanges of information and experimental data between countries; training of specialists and trainers; exchange and joint production of software; material and financial support and development of research. High hopes were placed in the Intergovernmental Informatics Programme (IIP) created by Unesco for implementing these projects. This programme, in which education has priority, has already undertaken actions along these lines.

In addition, in order to contribute to mastering all the issues raised in this field, Unesco is planning to set up a data bank on the penetration of informatics in education systems, training in or by informatics and the computerized management of school systems.

All international meetings dwell on the importance of developing research. Indeed, informatics is often regarded as being an instrument for the reform of school programmes and teaching methods and as a prerequisite for preparation for the world of employment. It is essential, therefore, to evaluate its applications and its economic, social and cultural effects. Lastly, comparative intercultural studies on the role of informatics in information are a prime necessity.

New distance education technologies

The new communication technologies have been a source of a large number of innovations in the distance education sector. There is currently an abundance of projects although, for the moment, most of these are confined to the industrialized countries. Some of these are experiments and pilot projects whose effectiveness and viability have not yet been fully demonstrated, but others appear to have already stood the test and be firmly established.

The use of the new communication technologies in distance education ranges over a variety of applications, including teaching, the management of education systems, information accessing and interpersonal or group communication.

The usual practice is for distance education to be by correspondence. Many projects all over the world, especially in the developing countries, also make use of the mass media (radio and television). Satellite technology has made it possible to engage in large-scale education programmes, such as that by the Insat satellite in India. In a number of Asian countries (China, India, Indonesia and Thailand), hundreds of thousands of people follow distance courses on television, often with the backing of other teaching aids. Most of these projects are addressed to people who have been unable to join the formal education system and who follow distance courses at the general or technical secondary level or to university standard. A considerable amount of literature has already been published on distance education by the traditional broadcasting media.

Projects making specific use of the new technologies for distance education are of recent date and are still virtually at the experimental stage. They have seldom been the subject of specific studies and global evaluations.

Telematics, i.e. the linkage of informatics and telecommunications, is at the root of various innovations in this sector.

The interfacing between terminals and service centres has made it possible to develop distance computer-assisted teaching (CAT) in the form of courses, exercises and tests in different subjects. Applications of this type exist in different countries. In the United Kingdom, for example, the central computers of the Open University are linked by its own telematics network to some 300 terminals installed in its local study centres, where students come to attend CAT courses in various subjects, including informatics. It is also possible for people to have access to the network from their homes by using a personal computer fitted with a modem.

Videotex can also be used for this purpose and, in France, some telematics services providing CAT courses in grammar, Basic, mathematics and logic, for example, are accessible from a simple Minitel terminal (the French telematics network). In addition to courses, videotex also provides teaching assistance in the home and the pupils can put questions to the teachers, who help them with their homework. Users have to pay for these individualized distance teaching-support services by defraying the cost of being connected up to the network and in some cases by also taking out a subscription.

Distance education systems based on telematics now seem to be used primarily for initial and further vocational training. For example, some European airlines have set up a CAT foreign-language teaching operation for staff starting to learn a language. This system uses the companies' arrays of terminals which are permanently connected: the courses can be followed from a large number of countries on all the continents and communication with the central computer is ensured by telephone line, satellite or the companies' own business networks. This training programme is accompanied by a direct message transmission service, which enables the users to communicate with a team of instructors. Similar CAT systems also exist in the services sector, including banks and insurance companies, and in industry. For large companies, distance training by telematics is a profitable proposition, since it often uses existing business networks and allows economies of scale to be made by reconciling the courses with people's continued presence at work, saving on the cost of training courses and travel, integrating training into the workplace, and so on.

However, CAT is an approach that often proves costly for institutions responsible for education nationwide. By contrast, the use of telematics for the teleloading of educational software is a more profitable and widespread solution in education systems. This method is based on the transmission of software to micro-computers by a server centre via the telecommunications network. Users can order educational software or specific files from the 'menu'. There are now many projects of this type. In Austria, for example, a national system which has been set up for higher education is based on the teleloading of courses for students' own personal computers. This principle has also been adopted by the 'Centre national d'études pédagogiques' in France, which distributes software and exchanges it with its different regional centres and with schools.

Videotex can also be used for teleloading software by adding a peripheral device to the videotex terminal, as in the case of the experiments being conducted in France for adult vocational training, with communication links between students and teachers being maintained by a message service. The linkage of home CAT and an electronic message service makes it possible to combine individual work modules and the direct and personalized monitoring of the learner by the instructors. The role of telematics in distance education also features among the prospective services that could be provided by the Integrated Services Digital Network (ISDT).

Furthermore, the new technologies can be coupled with more traditional technologies for distance education. The computerized literacy programme launched by the BBC in the United Kingdom has enjoyed considerable success. In Bulgaria and Hungary, introductory courses on informatics are also broadcast on television. In the countries of Eastern Europe, several teaching projects include the communication dimension of informatics such as the local computer networks in the German Democratic Republic*, Bulgaria and Hungary, or a combination of different technologies such as video and informatics in Czechoslovakia and Bulgaria. These multimedia approaches employ the teaching dimensions specific to each type of technology.

Computer-assisted teleconferencing is another technique that is primarily used in the institutional and scientific fields. It has started to make an appearance in the training programmes of some American universities for courses and student tutorials by electronic message service.

The new technologies are also used in applications that go beyond the field of teaching. In universities in particular, telematics has become a management and information tool for educational institutions, used by administrative staff, teachers and students alike. Enquiries can be made by terminal on such subjects as information on courses, registration formalities, examination results, research laboratory activities, lifelong training programmes, conferences and sundry announcements. In some cases, there are also internal university message services that enable students to communicate with teachers. For example, several French universities have developed their own telematics services which are accessible to the general public throughout the country. The telematic method has also been tested for registering students, in an endeavour to improve the administration of university entrance applications.

Distance information is probably the most widespread application of telematics in education and research. Universities and research centres already have access to all kinds of scientific, technical and social data through a large number of networks. Data banks are consulted from inter-

* Reunified with the Federal Republic of Germany on 3 October 1990.

rogation centres in such institutions and, in some cases, simply from micro-computers or videotex terminals. Direct accessing makes it possible to engage in bibliographical research and make highly specific enquiries on some subjects. The new technologies have also brought about far-reaching changes in the work done by documentalists and librarians, who are given specific training in data computerization and telecommunication procedures.

There are a large number of networks giving access to nation-wide data banks in the industrialized countries, and some of these are linked to regional or international networks. In Europe, universities and specialized research centres have access to large amounts of scientific or technical data through networks like Euronet. The Euryclee network, which was launched by the European Community in 1986, provides information on recent developments in the new technologies as applied to education in the member countries and is accessible to heads of establishments, teachers, instructors and students. There are very many information and data networks in the United States and, in some instances, these are linked to networks in other countries or regions of the world. There also also international networks for accessing scientific information, such as Iniste which covers the teaching of science and technology.

Some of these networks are enhanced by an electronic mail application, which enables users to communicate through individualized letter-boxes. Electronic message services thereby ensure interpersonal communication between the members of the international scientific community. This system is more efficient than the telephone and also more practical, since it frees communication from the constraints imposed by different time zones.

The role of images, which are so important in training, is re-emerging with other techniques such as interactive videodiscs, which can be operated by remote control, and graphic videotex from synthetic images. Videoconferencing is also sometimes used for distance conferences between countries and continents.

Under its Comett programme covering training in high technologies, the European Community has launched the Euro-Pace project which couples satellite transmission with electronic message services. This specialized training system, which is intended for engineers and advanced students, accordingly combines television images for the courses received at specific locations and the interactive functions of telematics for direct communication between the people being taught and the experts.

Interactive cable television is also paving the way for the development of distance education on request. In North America, for example, some pay per view channels offer a choice of educational programmes. Educational televideo library services are being set up in other countries, including France, which uses cable networks for schools, so that they choose from catalogues the films that they wish to receive at a particular time. These applications display a degree of flexibility not enjoyed by school television, while the method of distribution is easier than sending out cassettes. Direct broadcasting satellites are also likely to offer educational and training programmes.

The literal explosion of projects in the distance education sector is now giving rise to a large number of experiments, and some over-ambitious projects have proved short-lived, while other more realistic ones are still thriving. There are still very few systematic evaluations on these different applications and on their real effectiveness and economic viability.

The role of research often seems to have been underestimated, and yet it would appear mandatory in such fields as project definition, feasibility, analysis of technical constraints, educational content, systems operation, methods of utilization, evaluation of effectiveness and project return.

Cost-effectiveness studies are essential for measuring the viability of these applications. In addition, a charge is often made for distance education via the new technologies and this can sometimes be an expensive item for users. This factor has to be taken into account at the market level.

The advantages of the new distance education networks have to be compared with those of the traditional networks from both the teaching and economic standpoints.

Special attention must also be given to the human dimension of these applications, such as the technical and psychological difficulties experienced by learners, learning problems, and the advantages and drawbacks deriving from distance screen education.

The different ways and means of using electronic messages in education also represent a particularly rewarding field of study embracing the teaching and scientific aspects, as well as the social and psychological factors involved.

Many of the applications referred to above require communication infrastructures that are costly and are for the time being concentrated in the industrialized countries. Some of them have demonstrated their relevance and effectiveness, while others are still at the trial and error stage. Moreover, a trend is emerging that may lead in the long run to individualized home education. This will entail having a micro-computer of a videotex terminal, but these technologies are not yet within the means of a large proportion of the population in the countries of the North and are even less widespread in the countries of the South.

It is particularly important to learn about these projects and evaluate them, so as to guide the choice that decision-makers in the developing countries will eventually have to make.

The new technologies are opening up new means of access to knowledge, the comparison of experiences and horizontal communication in the world of education. Their applications are many and varied and bear witness to the search for new methods and means of action, in order to cater for the new needs of education and training. The display screen is becoming the vehicle for innovative teaching methods.

Technology is not a cure for all ills, however. It only represents a means of solving a number of educational problems that have to be clearly defined and studied. The major high-technology programmes are not suited to every situation and the new technologies can be used for effective smallscale projects. Moreover, they can be combined with more traditional techniques and the complementarity between informatics and the audio-visual media has not yet been fully exploited. The logic of informatics combined

with the visual imagination is paving the way for a renewal of teaching methods and multimedia approaches are probably going to make considerable strides in the future. All these dimensions offer vast areas for research.

Lastly, studies should give priority to the intercultural dimension of the educational applications of the new technologies, so that systems can be evolved that are geared to the real needs and means of the developing countries.

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Chapter VII

The social aspects of the new technologies

Of all the work done on the new technologies, their social impact is probably one of the research subjects that has been covered least. This state of affairs can be readily explained. On the one hand, the social impact can only be measured with time and, in view of the novelty of these technologies, their effects on society are only just starting to emerge. Secondly, the new media are spreading in accordance with an industrial and commercial style of thinking and are only seldom accompanied by studies of the population's real needs. Technology is running ahead of social demand.

The restructuring exercises entailed by the communication facilities now on offer have primarily caught the attention of public and private decision-makers, who are more interested in the technical feasibility and financial return of projects than in the social aspects. Research-funding bodies have accordingly often given preference to the economic and institutional aspects of the new technologies.

In spite of this situation, which is not conducive to sociological research on the impact of the new technologies on societies, some work, largely of an academic nature, has been done on this subject. It raises fundamental issues as to the social significance of the new technologies. The problem areas investigated cover, among others, the subjects of democracy, life styles and alternative uses of the technologies.

A democratic or inegalitarian process?

The new media have given tangible shape to many people's expectations. As symbols of technical progress and economic recovery, they are also perceived as a means of renewing the process of social communication. The specific technical features of these new tools offer the potential for the democratization of communication and some of their uses clearly militate in favour of a broader receptiveness to communication. But the development of the new technologies also gives rise to untoward effects which, *a contrario*, now bear witness to a situation of social inequality.

The positive aspects of the new technologies can be measured by a number of yardsticks, such as broader access afforded to the media, the development of interactive communication and the advent of horizontal communication.

The audio-visual explosion is reflected in the abundant supply of programmes, which is significantly increasing the choice available to television viewers. The creation of new private channels in Western Europe, as well as in other parts of the world, the appearance of toll channels and of cable network theme channels, and the entry into service of direct satellite broadcasting are all giving rise to considerable diversification of supply. In the regions affected by these developments, the movement is doing away with the rigid television model. From being a captive audience at the receiving end, television viewers now find themselves with a freedom of choice that enables them to select programmes suited to their tastes, whether these be national or even foreign programmes, as in the case of the European cable networks, for example, or direct satellite reception. However, this vast number of programmes is not accompanied by a comparable increase in the variety of the products, but rather by the risk of the programmes on offer becoming uniformized and repeatedly focused on standardized entertainment products — especially films — for reasons connected with the economics of the media and the production conditions already discussed. Even so, by increasing the number of broadcasting sources, the new television has, in the wake of the expansion of radio stations on the FM band, contributed to providing greater access to audio-visual communication. In addition, the substantial growth in the number of sources of information and entertainment is actually contributing to the circumvention, and indeed the limitation, of formal and informal forms of censorship and greater exposure to the world at large.

Video technology represents a break with the vertical model of media broadcasting and reception. As we have seen, video recorders have now reached a substantial proportion of households in the industrialized countries, as well as households with television sets in the developing countries. They represent a decentralization of access to communication in the home and a means of escaping the programming of the television stations. The use of video is grounded in the freedom of individuals to choose the audio-visual products they wish to watch. Moreover, video recorders offer considerable potential for participating in communication. By the addition of a camera, they become a production tool that can be used by individuals or the

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community, even though, as studies have shown, the number of people with video cameras is still low and their use often confined to recording family events. In the vast majority of cases, they are still generally used merely for recording and watching films at spare moments which people are free to choose for themselves.

In some cases, video makes up for the shortcomings of the film distribution system, as in India where it is reckoned that there are some 50,000 video parlours bringing together as many as several hundred people at each showing. This technology has become the poor man's cinema, where it is possible to see endogenous films in more than fourteen languages. It is true that the cheap products made for video networks have contributed to the crisis in the film industry, but, on the other hand, it has given the underprivileged members of the population access to the world of images.

Micro-informatics has, in turn, brought computers within the means of small firms and private individuals. Their use enables people to become self-reliant and, hence, increasingly independent of large data-processing centres. Micro-computers are also contributing to lifting the veil of mystery surrounding informatics among the general public and to affording access to a technical culture that was hitherto reserved for specialists. This democratic aspect is probably not altogether irrelevant to the use of the term 'user-friendly' to describe micro-computers.

Interactive communication is another asset of the new technologies. It is admittedly still limited in extent, but the new networks, including the Integrated Data Service Network (IDSN), are expected to expand this function.

The provision of return channels from receiver to transmitter is therefore enabling some cable networks to put out requests for specific programmes in the case of pay per view television. However, the possibilities of viewer participation are still limited on coaxial cable networks, whereas fibre-optic networks, although still at the experimental stage, hold out the promise of a wide range of services provided at the user's request. In fact, they offer a large number of applications, including entertainment, practical or commercial services and community projects, as has been demonstrated, among other examples, by the well-known Japanese experiments of Tama CCIS (Community Cable Interactive System) and Hi-OVIS (Highly-interactive Visual Information Service). Interactive television represents a departure from the monodirectional and vertical conventional television system and heralds the emergence of the television receiver as an active participant in the communication process.

Telematics is probably the technology that has so far been instrumental in introducing the largest degree of interactivity into communication networks. Videotex, in particular, gives users in institutions, businesses and private households access to a host of information and services. It enables answers to be given to all kinds of specific administrative, occupational, practical and other information needs and to engage in such transactions as making reservations, banking operations, tele-shopping, and so on. This technology can also foster participatory approaches to communication. In France, for example, television channels frequently call on people with a Minitel videotax terminal to give their views on subjects of public interest during news broadcasts or political debates. These electronic opinion polls, to which individuals reply directly on their videotex screen and the results of which are immediately displayed on television, are intended to sustain the attention of the television viewers and to elicit their reaction to the subjects being discussed.

The widening of the scope of interpersonal horizontal communication also represents a means of democratizing communication systems. By developing electronic mail, telematics networks open up new communication circuits which allow greater flexibility in the remote exchange of messages, even at the international level. Professional message services can, in some cases, alter the traditional ranking order of the dissemination and exchange of information in companies by fostering more open and direct communication between the different categories of personnel.

A variety of electronic message systems are available to the general public. In a large number of cases, they are addressed to people with microcomputers, who are connected onto the telecommunications network through a peripheral. These communication systems often bring together computer 'freaks', but they are now being opened up to a wider range of users. Compuserve and The Source, the main telematics communication services in North America, accordingly provide, among other services, horizontal communication between large numbers of micro-computer owners. Here networks are sometimes coupled with data base services, as in the case of the Micronet and Microlink networks in the United Kingdom, which are respectively connected to the Prestel videotex service and British Telecom's Telecom Gold Electronic Mail service, and are used by tens of thousands of people. The industrialized countries also have a host of small message services, known as Bulletin Boards which, in addition to being used for discussions on informatics or other subjects, such as the environment, provide an opportunity for transmitting small advertisements. But they are also the starting-point for new social links between the participants. The French videotex network message services, which are chiefly used by young city-dwellers, were, in fact, created to cater for people seeking to make social contacts. The main topic is 'dating' between members of the opposite sex, but research has also shown that these exchanges of messages were the occasion for the emergence of new forms of social intercourse making up for the loneliness and lack of social integration in large urban areas. Thus, telematics results in another form of social exchange that is promoted through the media by means of a technology which broadens the scope of interpersonal communication networks.

In short, the new technologies are based on an operating pattern which, as a result of the increase in the number of channels, interactivity and interpersonal relations, is contributing to the democratization of communication.

Nevertheless, the process by which the new technologies are disseminated is accompanied by negative effects which make it necessary to hedge the outcome with qualifications, since it conceals marked disparities as between both different social groups and different regions in the world.

In the industrialized countries, at the present time,

audio-visual technologies are still distinctly more accessible than informatics technologies. In many countries, video recorders have entered into more than half of all households, but they are still too expensive an item for a substantial proportion of homes. Cable television is highly developed in North America and the small European countries, but it is still marginal in the other countries of the world. In cases where cable television is available, the subscription often costs too much for it to be within the means of the poorest families.

Micro-informatics is still a technology confined to affluent social groups. It is true that the micro-computer penetration rate is relatively high in some countries, such as the United Kingdom, where they have been acquired by one-third of all households, but this figure includes a large number of low-performance models, which can scarcely be used for any purpose other than game-playing. Micro-computers of a semi-professional or professional standard are chiefly owned by the higher social classes, which not only have the capital needed to purchase them, but also the cultural background which makes it possible to use them for a variety of purposes. Moreover, computer literacy, which grows with the use of micro-computers, is a new form of knowledge from which people who do not have access to them, such as those of a low socio-cultural level and the elderly, are debarred.

Again, interactive services are used to the full extent only by a fraction of the population which, firstly, have the funds needed to defray the cost and, secondly, enjoy a life style warranting the consultation of data banks and transaction services. In that respect, the quantitative surveys carried out among Minitel users in France are significant. Notwithstanding the fact that the telecommunications authorities supplied the terminals to homes free of charge, manual workers and the unemployed make very little use of the fee-paying videotex services, which are chiefly used by the upper and middle socio-professional categories.

The findings of the studies carried out in a number of industrialized countries point to growing inequalities in people's access to communication technologies. The social groups enjoying the best traditional technological facilities in terms, for example, of the number of telephones and television sets, are those with the largest number of new technologies. Cable television subscribers are often among the people most likely to have video recorders. Furthermore, people with both new audio-visual and informatics technologies account for only a small fraction of society. Studies have accordingly identified a group of trail-blazers who have a whole array of communication equipment. This over-equipped group is above all composed largely of young people living in large urban areas and belonging to the upper and, to a lesser extent, the middle classes. These are the people who make most use of informatics products and the new interactive communication services.

Interactive networks, such as the Integrated Data Services Network, represent an enormous investment, and this is prompting some countries to limit their development to urban and industrial areas displaying a given rate of return.

The problem of the access cost is becoming a new economic fact of life which distinguishes the new communication services from the old distribution systems. Access to these services usually requires the purchase or hire of additional equipment, such as a decoder for television or a communication peripheral for computers, to which the expenditure connected with the provision of services has to be added. For instance, the cost of subscribing to the services provided by the interactive television systems being tried out in Japan are some ten times higher than the cost of a television licence fee.

Present trends in communication systems are based on the principle of differentiation between the services provided. Alongside the habitual basic services for which a moderate tariff is charged, the new services, which are usually described as value-added services, are ushering in a new conception of information, which is becoming increasingly likened to a commodity. Such services, including those managed by the public sector, are operated on the basis of the economic rate of return. For example, telematics services in such areas as administrative information, health and welfare are charged to the people making the enquiries. The new services are starting to detract from the principle whereby public information is made available free of charge, in that a fee is now being levied. Moreover, commercial services, like tele-shopping, which are likely to be of interest to elderly people and the disabled, are generally proving to be beyond their means on account of the high rates charged. The cost of the new communication networks is therefore denying people with low incomes from having access to them.

Research has pinpointed the social groups which are partly debarred from markets offering the most advanced communication and information services, either on account of their low earnings or else because of their age, low standard of education or social acculturation. The new technologies could accordingly be said to be creating new forms of social segmentation between the *information rich* and the *information poor*.

These inequalities of access are even more significant in the developing countries, where the procurement of new technological tools is broadening the considerable gap between the small proportion of the population which already has the traditional media facilities and the bulk of the population which is deprived of them. It is a fact that micro-informatics in the home is still extremely limited in those regions, but studies have shown that video recorders have become a common technology, and indeed a factor of social refinement for affluent families.

At the international level, the new communication services are still largely concentrated in the advanced industrial countries, as stressed in the previous chapters, and the increasingly marked imbalances between those countries and the rest of the world is becoming a crucial issue.

Social change

The upheavals in communication in the course of the past decade have been responsible for significant changes in individual behaviour patterns. The public exposed to com-

munication technologies is being fragmented as those technologies come increasingly to be used for individual purposes and attitudes become more and more independent-minded. Through these changes, which are affecting the way people live, advance signs can be detected of the coming of the 'electronic home'.

Studies on the uses of the media and the new technologies have so far chiefly been confined to the industrialized countries. They have noted the increasing part being played by communication activities in people's everyday lives and time management.

Audio-visual consumption remains the dominant activity, especially since the new supply of television products and video recorders is contributing to bringing a permanent flow of images into the home. The television screen has become the main vehicle of entertainment in many regions of the world. It is true that North America is still the region where the average home television viewing times are longest, at some seven hours a day, but there is a growing overall tendency in several European countries for people's exposure to the TV screen to rise, although it has not yet reached the same level.

This intensive viewing is particularly marked among children and, in the industrialized countries, it is often higher than the length of time they spend at school. Television sets often act as 'child minders', and this again raises the issue of the influence of television on the values, attitudes and behaviour of young viewers. Violent sequences are a feature of a large number of children's programmes and video clips for young people, as has been noted in a synoptic study which has been carried out with Unesco's assistance and which engages in an analysis of a considerable amount of research on violence and terror in the mass media. The consensus emerging from this research underscores the adverse effect of violent products on the psychological make-up and behaviour of young television viewers.

Besides violence, the question also arises as to the effects of a substantial increase in advertising on the spread of the values of consumerism in society.

However, the growth of audio-visual consumption varies with the sociocultural environment. For example, studies carried out in the United Kingdom and Sweden have shown that video recorders play a specific role in different social classes. The higher social categories primarily use them to record the programmes of their choice and to avoid being bound by the constraints on their time imposed by television programming, although they do not spend any less time in front of the television set. On the contrary, video recorders are responsible for a significant increase in audio-visual consumption among the lower social categories, who not only watch as much television as before and record other programmes as well, but also hire more films.

Another factor in changing audio-visual behaviour patterns lies in the emergence of increasingly independent attitudes among the people at the receiving end. Faced with the abundance of products on offer, audiences are evolving and are becoming more and more compartmentalized. Changes are taking place in the picture of a vast passive public of viewers,with their eyes all glued to the same programmes, which contributed to shaping the traditional image of the mass media. The masses exist no longer as a single solid block, but are splitting up among the different technologies, whether it be television transmitted by radio wave or cable, the video recorder or direct satellite reception in some regions, and among the different programmes they are offered.

The consumers of the new television are now setting themselves up as active users, who make full use of their freedom of choice. Thanks to the remote controller, they can indulge in *zapping*, which enables them to switch instantaneously from one channel to another in their search for fresh images. This mobility of television viewers is reviving the competition for audience ratings between rival channels and is a source of frustration to advertisers, who dread this method of avoiding their messages. The new-found freedom of viewers has led to the introduction of increasingly precise and highly sophisticated audience measurement methods which make it possible to know how many people are gathered round each television set at any particular time.

Another feature of the changes in habits is the tendency for viewing to become an individual affair. As it becomes increasingly common in the industrialized countries to have more than one television set, as is often the case in one-third or more households, there is a reduction in the family arguments exacerbated by the wide range of programmes, and differences in taste and personal choice are therefore fostered.

In the case of informatics technologies, the purposes for which they are used have tended to be a private matter right from the outset. Studies carried out on the process involved in the adoption of these technologies have shown that while several members of the same household may use them in turn, each individual adopts a personal approach.

Within the family unit, marked differences have been observed in the ways in which informatics technologies are assimilated. The age group is instrumental in separating children, who pick up the technologies at once, from adults, who have to make an effort to learn. The sex of the person is also an added significant difference, since men use the technologies more than women, and even small boys acquire a greater command of computers than girls. Machines continue to be an attribute of the male sex, and this acculturation has a dissuasive effect on the other sex. In addition, women generally use computers for functional purposes, whereas there tends to be a game-playing and technical aspect in their use by men.

Research on telematics and informatics in the home have also shown the independent attitudes displayed by users, who employ these technologies in a wide variety of ways, as well as for both game-playing and practical purposes. Telematics services providing for distance information and transactions cater for specific needs, and links tend to be of short duration. By contrast, leisure services occupy a significantly larger place in people's time budgets. For example, although the game-playing services of the French videotex system are consulted by only a small fraction of the population equipped with the system, they account for a substantial proportion of the general public's telematics traffic.

The game-playing phenomenon is also symptomatic of

the behaviour of amateur computer experts who are addicted to the pleasures of programming. These people, who are young and overwhelmingly male, are totally committed to this hobby which they practise to the detriment of other activities, like watching television. Research done in North America and several European countries has produced very closely correlated findings on the profiles of micro-informatics users and the ways in which they use the technology. Games account for a very significant proportion of the uses, especially among children, who seldom make use of their micro-computers for educational or creative purposes. The use of high-performance computers for work purposes at home is also an established feature among the higher socio-professional categories. However, the initial enthusiasm for the discovery of informatics and for home management seems to have faded somewhat. Some people have given up their micro-computers, after having been baffled either by the complexity of informatics or by the technical shortcomings of their equipment, or else merely by the fact that they have no real needs warranting the use of a computer.

This waning of enthusiasm can also be seen in the case of other technologies. The initial urge weakens with time and, little by little, they become commonplace and are only used for narrowly circumscribed purposes. The use of the new technologies is founded on their progressive integration into everyday life.

The whole range of communication products on offer to the public entails an effort of individual choice, for although people's free time has increased slightly in recent years, it cannot go on being extended indefinitely. The new technologies admittedly make it possible to dispense with a number of domestic chores, as a result of tele-shopping and other remote transactions, which are particularly appreciated from the standpoint of time management. But the variety of audio-visual and telecommunications services entails deciding on the purposes for which they should be used and on the amount that can be spent on them, and these factors bear a correlation to living standards and life styles.

People are progressively acquiring communication goods and the situation is currently one where households have a mixed bag of facilities, with some of them giving preference to the audio-visual media or to informatics or else to telecommunications, depending on their incomes and their priorities. Only a small group of front runners belonging to a social and economic elite has the whole array of facilities.

Nevertheless, homes are gradually becoming technological cells. Many households are already equipped with a variety of radio receivers, telephones and sound or television recording equipment. But new generations of terminals and equipment are also coming to be installed in homes, including micro-computers, television decoders, video recorders, touch and special function telephones, telephone answering machines, compact disc readers, video-game keyboards, and so on. With telematics, homes are coming to be increasingly connected with the outside world and the domestic unit is being integrated into a variety of communication networks. Home automation which, among other things, makes it possible to remote-control domestic facilities like the electricity supply, and various telesecurity systems are being tested in different places. The Integrated Services Data Network is also holding out fresh communication possibilities for households.

Research is raising a host of issues about the coming of the 'electronic home' and its effects on leisure, services, work and social life.

The fact is that homes are increasingly turning into leisure centres. This trend, which already started with the traditional mass media, is not a recent one, but the question arises as to the influence, in the long run, of the new technologies on the entertainment industry, including the theatre and cinema, which have already suffered heavy audience losses. The growth in home entertainment possibilities is also likely to cause the family unit to retreat into its shell and to withdraw more and more from society at large.

The entry of information and transaction services into households is making it possible to engage in a large number of home-based activities and operations which formerly entailed moving physically from one place to another. The resulting time-saving is invaluable, but these services also result in a loss of human contact with the outside world.

The new technologies are also bringing back work at home. Remote work in executive business occupations has so far not become very widespread, but the practical advantages it offers, such as the doing-away with the time spent on travelling and the flexibility of working hours, are offset by social isolation, especially in the case of women engaging in this form of work. Moreover, people in the higher socio-professional categories who use computers at home find that they work more and that the dividing-line between their personal life and their occupation becomes increasingly blurred.

Interpersonal communication via telematics makes it possible to participate in discussions, in written form, with close acquaintances or even with unknown people. User-friendly message services are even introducing a new form of social exchange under the cover of anonymity, where pseudonyms are used and the messages are partly fantasized. This imaginary social intercourse between people who do not know one another gives rise, in some cases, to actual meetings and to more far-reaching forms of sociability. But the use of technology to establish interpersonal relations also points to the problems of loneliness and difficulties of social integration in post-industrial societies.

All these developments illustrate the key place occupied by technical mediation in engaging in ordinary activities, since interaction with machines is, in various cases, a substitute for human interaction. They also illustrate the tendency for the borderlines between public and private space to be abolished, and this upsets the traditional compartments and alters the organization of social life.

Hence, a whole series of questions are still outstanding and call for research on the model of society now evolving. The question is whether the 'electronic home', connected to a large number of communication networks, will, paradoxically, be a source of increased isolation and a severing of social ties. Will the added individual freedom gained as a result of the new technologies be accompanied by another form of alienation? What are the respective parts played by

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technological development and social change in the transformation currently taking place? How do these two extremes tie in with one another?

Quantitative research on uses and time-budgeting is making it possible to identify the overall trends. However, this work done at the national level is still of a piecemeal nature and comparative analyses covering several countries are needed to obtain a better picture of the effects of the new technologies on societies. Qualitative studies of an ethnographic nature also make it possible to discern more clearly the social significance of practices, the features of the respective use of different technologies and changes relating to ways of life. Some research of this type has already been undertaken, but it would be worthwhile carrying it out in different cultures so as to be able to engage in an analysis, at the international level, of the complexity of social change and the manner in which it occurs.

Alternative uses

The industrial and commercial thinking behind the dissemination of the new technologies fosters considerable growth in tools and products which stimulate access to communication. However, the availability of a wide range of choice does not necessarily mean that people actively participate in communication processes. In spite of the potential for democratization afforded by the new technologies, the dominant model is still that of consumption, even though this is based on a more active and freer relationship to communication. In fact, this situation appears to be in osmosis with the evolution of society which, in the advanced industrial countries, is characterized by a return of individualism and a withdrawal into the home, which are not very conducive to collective uses. The ideological currents which had upheld community projects in the 1960s and 1970s have become somewhat subdued. Self-expression and personal achievement have become the rallying themes of the 1980s and they go hand-in-hand with the new technologies.

In spite of this overall context, which defines the overriding trend of the purposes for which the new technologies are used, they give rise to uses that represent an alternative to conventional communication models. In the first place, communication facilities enable ethnic and cultural minorities to express themselves through a variety of media. In turn, even though community projects are now fewer in number and are given less attention, they still exist in various regions of the world.

Video is an autonomous and particularly flexible instrument of communication which enables it to play a major role in multilingual societies. In India, video recorders have become an alternative to the cinema in towns, as well as in the remotest country areas and, as we have seen, enable videograms to be broadcast in a large number of languages. Indian films on video cassette are also distributed in other countries and have a large audience among immigrant ethnic communities. In the United Kingdom, studies have demonstrated the success of video recorders among Indian and Pakistani families, which can watch large numbers of films linking them to their culture. These ties with the community of origin, which are sustained through video, can be seen among many expatriate communities. For example, parallel distribution circuits have been created for Yugoslav workers in the countries of Western Europe, who receive video copies of the programmes broadcast by their country's television stations. The extent of the demand from Yugoslavs living abroad has even prompted television organizations to make videocassette recordings of performances by the most popular local artists. Video cameras are also used to film family events and hence maintain the primary relations despite the distance.

In addition, video technology has been instrumental in creating an independent video production and distribution sector making documents on subjects of political, social or cultural interest. These videograms are usually produced by associations or groups and are distributed through a parallel circuit consisting of local communities, networks of associations, and so on. In the industrialized countries, large numbers of independent video groups have been identified. Video often serves as a vehicle of expression for underprivileged groups which do not have access to the circuits of the media institutions, or only to a limited extent. The British miners' strike, for example, gave rise to the production of a series of videograms which made it possible to publicize the problems and views of the strikers. These cassettes were seen by a large audience, since some 8,000 copies were sold and shown at meetings.

In Latin America, video groups use this technology as an instrument of consciousness-raising and community development in several countries. In Brazil in particular, a large number of video groups have been set up and work with popular movements, trade unions, local associations, churches, schools, and so on. The video productions are aimed at involving underprivileged members of the population in community projects and act as a catalyst for sparking off an awareness of development problems. In some cases, they are also distributed outside such communities by way of illustrating the expression of popular movements. Video's powers of political mobilization have been seized on by trade unions, some of which have fitted themselves out with production equipment. The growth of these groups has led to the creation of a Brazilian association of the video popular movement, which publishes a catalogue of the videograms available and is attempting to set up distribution circuits throughout the country.

In India, video is used as a development tool by the women of the Self Employed Women's Association (SEWA) in Ahmedabad, which brings together 22,000 women occupying small independent jobs in the informal sector. Some of the members of this association, including women who are illiterate, have been given training in video production techniques and are producing films on their working and living conditions. Video offers these poor women an opportunity of expressing themselves freely and explaining their difficulties. The video films are then shown at meetings and provide an occasion for the women to exchange their experiences and examine the possibilities of change. The SEWA Association also sends some of the videograms to political decision-makers, in order to call

their attention to the problems of its members.

In the developing countries, video is also used by government institutions for education and training projects. In Peru, for example, the Ministry of Agriculture has made more than 1,000 videograms for rural training purposes. A video literacy project has likewise been undertaken by the Ministry of Education, but it has had to contend with financial problems. Nevertheless, these ventures are very irregular and are not very widespread in the regions of the Third World.

Video is a training aid used by many public organizations and private companies all over the world. It has fostered the creation of closed television systems, as well as of cassette distribution circuits in the professional and institutional networks.

The growth of local media is another aspect of the development of communication systems. Local television networks show programmes on subjects of interest to the community. The vast number of independent radio stations set up in the 1970s, which allowed local groups to express themselves freely, have often turned into purely commercial-type radios but, in Scandinavia, many neighbourhood radio stations are thriving and are an incentive to the practice of local democracy.

In Spain, community cable networks were established independently in the early 1980s, at the instigation of neighbourhood associations and small firms, which set up overhead lines between buildings in different quarters, so as to enable them to receive video films. The success of this spontaneous venture, which grew quickly in Andalusia and spread to other regions, bears witness to the desire of the population not to be restricted to the two national television channels and to enjoy a wider choice of programmes. Although the programmes broadcast on these small-scale networks chiefly consist of entertainment films, the experience shows that people can organize themselves to build new communication networks and have access to images. Even so, the fact that authorization was given in August 1989 to set up three private television channels in the country is liable to change the situation of these community networks.

In spite of the preponderant number of standardized entertainment programmes on cable networks, public access channels still represent means of expression made available to the community. In the United States, cable also caters for the language differences of the Hispanic or Asian minorities and some channels address the public of those communities in their own languages. Specialized channels also cater for specific interests, such as sport (Entertainment and Sports Programming Network), news (Cable News Network), culture (Arts and Entertainment Channel), science (The Discovery Channel), religion (Christian Broadcasting Network), children's programmes (Nickelodeon and Disney Channel), and so on. All these commercial networks meet a specific socio-cultural demand. In addition, a number of theme channels of this type broadcast by satellite to cable networks in other regions of the world.

The new informatics technologies are also giving rise to projects geared to the needs of the community and specific population groups.

Computers are used in special education programmes for disabled children. Informatics applications for the use of the blind have been produced with machines specifically equipped to process braille. Micro-informatics clubs have also been set up, with the support of the authorities, in the poor quarters of cities in different countries, in order to afford young people from the underprivileged classes readier access to this technology.

In some places, the new telecommunications networks have made it possible to set up home tele-alarm systems for the elderly and the sick, so that they are permanently connected to emergency medical services.

Telematics also includes some community or social projects. These interactive services exist in various countries and are addressed to groups with specific information requirements. They appear to be marginal, however, compared with the whole range of services on offer and usually suffer from a lack of resources, which limits their impact.

In the United Kingdom, for example, pressure groups and voluntary associations have set up data banks on the Microlink network to provide information on the law, health, education and social welfare. Free community information services also exist on small bulletin board networks. In France, a large number of municipalities have developed videotex services providing information on their town and local public services. A fee is charged for these services, but they are accessible on the network at the reduced videotex rate. The political parties also have their own telematics information services. Some associations have produced community applications covering practical information on such subjects as local sporting and cultural activities, art workshops and babysitting, as well as message services designed to foster social contacts in the community and encourage discussions on issues of public interest. However, these experiments in local democracy are very limited and only a small proportion of the public takes part in them, especially since, owing to the economic constraints, access to these services is not always cheap. In the case of women, the 'Elletel' telematics service provides a whole set of information on the law, employment, training, social security, health, babysitting, and so on. The data bank is designed to direct women to specialized centres by providing them with addresses. Information is also given on the latest women's books to be published, national and international demonstrations by women, and defence committees for women who have been beaten or raped, for example. 'Elletel' has an electronic mail and direct message service which enables women to hold discussions among themselves, even though the network also attracts men. However, the cost of the service remains a factor that prevents it from being consulted on a larger scale.

Many user-friendly message services on the French videotex network cater for spontaneous public demand. At the outset, the telecommunications authorities had not expected this type of service to grow, and it came about through the initiative of users, who grasped the interactive communication potential of videotex. This 'hijacking' of its original purpose points to the drive displayed by society, which is capable of developing new networks for social communication. It is true that a large number of commercial

services have since taken advantage of this 'slot' to offer message services at a high charge. However, like the Spanish community video networks, this development underscores the role which social independence can play in the configuration of communication systems.

Alternative uses of the new technologies, and especially community applications, are still not very well-known. The marginal character of these practices in relation to the mainstream does not necessarily detract from their importance, and the actual ways in which these projects operate and the effects they have on society are rewarding subjects for research.

Generally speaking, studies on the social impact of the new technologies need to be developed. They are essential for grasping the present and future changes in our societies. Only a limited stock of knowledge has so far been built up on the uses of these technologies and on their effects on individuals, groups, institutions and nations. The area to be covered is enormous and research is faced with a host of questions that will require both quantitative and qualitative work. Furthermore, it is becoming urgent to engage in a comparative analysis of the social repercussions of the new media on an international scale, in order to identify more closely the models of society that are coming into being and to shed light on future trends.

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Chapter VIII

The interaction between technology and society

Today's technological revolution, which stems from the ever-closer links between the audio-visual media, informatics and telecommunications, is transforming communication systems, and the 'information society' now taking shape is a source of considerable debate.

Analysis of the main effects of the new technologies has demonstrated the scale of the upheavals produced in countries' economies, legislation and cultural, educational and social life. In view of the increased pace of these changes, research has an essential role to play both in identifying the ways in which the new technologies are applied and in evaluating their effects. Scientific facts are urgently needed to assist with decision-making and action.

The many research issues raised in this survey accordingly prompt the formulation of a set of recommendations calculated to offer guidance for Unesco's programme.

The information society

The forms taken by the new technologies can be seen in concrete terms in various areas of social activity, but they are also fuelling a new ideology. 'Information' has become the *leitmotiv* of modernity and the new technologies are taking on a symbolic value. However, there is certainly no consensus about the information society and many of the statements made about it entertain either great expectations or serious doubts as to the evolution that it is supposed to produce.

The optimistic prophecies liken the new technologies to socio-economic progress and the liberation of mankind. This view holds that they represent a means of emerging from the economic crisis and of giving fresh impetus to growth. Automation will mean the end of drudgery and the growth of free time for leisure activities. The new technologies also hold out the promise of a revival of democracy and individual freedom through the active participation of citizens in communication systems. Individual self-expression will be ensured by the broader range of choice of entertainment and training facilities, while the new services will make everyday life easier. Moreover, horizontal communication will enhance social change or may, in the long run, culminate in the coming of the global village.

On the other hand, the heralds of the apocalypse see the new technologies as a danger. They are regarded as being a source of further imbalances and of even more marked domestic and international inequalities. Far from being a step forward, they will increase unemployment and make human beings even more dependent on machines. Data banks represent a threat to individual freedom, security and national sovereignty. The new technologies will foster increased individualism and chip away at social cohesion, so that the principles of solidarity and social welfare will disappear. They will spread a standardized universal culture that will be based on materialism and undermine endogenous cultures. Cold rationality and technical efficiency will gain the upper hand over intuitive thinking and humanism.

There are a host of examples that can be quoted to bear out the two points of view. But while these discourses are contradictory in the arguments they propound, their premises concur. Both are based on a belief in the overwhelming power of the new technologies and both disregard the role played by society.

Yet the development of the new technologies is a very complex phenomenon for which no predetermined causes have been traced. Individuals, groups, enterprises, institutions and organizations do not merely respond to the technology on offer; they also have an effect on configurations and applications. A series of adjustments and negotiations take place between the technical supply and the social demand. Society is not merely a dumpingground; it is permeated by its own changes and is a source of action. The dissemination of the new technologies is a process which brings into play a series of relationships between technological innovation and social innovation, and these relationships are not yet clearly understood.

The information society now seems to be identified by a two-fold pattern of universalization and differentiation.

The universalizing effect stems from its intersectoral and worldwide character. The new technologies have infiltrated into all sectors of society. They are recasting the structure of the economic mechanisms of communication systems, altering institutional and legal frameworks, triggering off reforms in education, creating new forms of culture and influencing ways of life. The whole range of social activities is affected. The intermeshing of society is spread-

ing from the national level to the regional and international levels. The transnationalization of information is increasing and a complex overlapping pattern of communication systems, based both on the growing dependence of the developing countries and interdependence between the different regions of the world, is coming into being.

However, the growth of the new technologies does not conform to a uniform model. The rates at which they are installed and spread and the ways in which they are used differ significantly from country to country, even among the advanced industrial countries. Economic strategies and institutional thinking are deeply rooted in national traditions and vary accordingly. Differences in cultures and life-styles also have an influence on the ways in which the technologies are adopted and used. The dynamic nature of social systems is expressed through feedback mechanisms which influence the technological configurations. The developing countries, too, vary considerably in the extent to which they are equipped with the new technologies and in their strategies for adopting them. The fact is that the countries of the Third World have complex and dynamic social systems which affect the ways in which the new technologies are adapted to their needs.

Thus, at the end of the 1980s, the state of the new communication technologies in the world looks like a vast mosaic. However, the question arises as to what the long-term impact of their growth will be. As we have seen, research has identified far-reaching tendencies that are militating in favour of a homogenization of influences, and these include the movement towards the deregulation and privatization of communication organizations, the concentration of the media, the standardization of the supply of services and images, the growth of work and entertainment through the agency of the technologies, and so on. As the new technologies become a crucial issue for many countries, the countries themselves are being faced with the challenge of a model of society.

The role of research

The integration of research into the process by which the new technologies are disseminated is fundamental in more than one respect. It is true that no technology is a ready-made solution to the problems which different societies are having to contend with, or a substitute for the development of human resources, which still remains a priority task. However, while technology may only be an instrument, this does not necessarily mean that it is neutral and the different forms of hardware adopted perform a role in organizing the way in which they are used and give rise to specific effects.

One of the roles of research is to identify needs and to produce a clearer picture of the complexity of the processes governing social change and the evolution of communication systems.

But research can only play this role if it is acknowledged, and regarded as legitimate. All too often, it is branded as being a purely intellectual, and indeed speculative, pursuit. Yet research is itself productive, since it produces a kind of knowledge from which many lessons can be drawn for guiding the development of the new technologies.

Researchers are faced with a vast number of far-reaching questions. The conventional paradigms are being shattered, since the new communication networks are becoming the vehicles for an extended form of information embracing images and data alike, while the audio-visual and telecommunications sectors are coming increasingly close together. Moreover, interactivity is upsetting the conventional vertical communication patterns, and the emergence of new information, transaction and horizontal communication services is blurring the borderlines between mass communication and interpersonal communication.

In the face of these developments, research too has to innovate both in its theoretical models and in the problem areas it covers. For instance, empirical studies have to define new methodologies for gaining an understanding of the increasingly complex communication circuits, the increasingly immaterial nature of information and the wide variety of applications.

The difficulties facing researchers are countless. In the first place, the facilities and products are so novel that they do not have the perspective necessary to gauge impacts properly. In addition, changes are constantly taking place in the communication field and, as a result of this shifting pattern, the data collected are soon obsolete and any attempt to engage in a global assessment is inhibited.

In addition, some of the research projects are too narrowly focused on specific technologies or on single subjects to be capable of shedding light on the complex nature of developments. Others take too general an approach to the new technologies to be able to pinpoint the on-going processes.

The new technologies have intersectoral implications, but there has so far been little multidisciplinary research. Similarly, the growing transnationalization of information requires more comparative research. There are few studies on the developing regions, yet that is where the inroads made by the new technologies are being most keenly felt.

In spite of these shortcomings, the record of research is by no means negligible: a large amount of data has been collected and many observations have been made and analyses produced.

However, the return on the investment made in research is limited by the shortcomings of the circuits for disseminating its findings.

These findings seldom reach the spheres of power, yet they could be useful pointers for taking decisions and engaging in particular courses of action. It is essential to capitalize on the studies and evaluations produced if the mistakes made are not to be repeated and if advantage is to be taken of the positive lessons that can be derived from communication projects carried out in different regions of the world. A readily accessible 'memory' in which research findings are recorded should be set up as a matter of priority. Such data could form the basis for an automatic documentation system which would make it possible for research to play its full role in building up and disseminating knowledge.

The findings of research, and especially of studies carried out in the developing regions, are also not very

widely disseminated in the scientific community. Yet the creation of circuits for exchanging information and collaboration between researchers would appear to be a prime necessity if work is to be undertaken on the evolution of international communication.

Lastly, knowledge has to be disseminated among the public at large, in the form of popular publications or programmes, in order to encourage its awareness and involvement in the development of the new communication systems.

Recommendations

The survey made in the foregoing chapters of the effects the new technologies are having in various fields has already made it possible to single out prospective lines of research. By way of conclusion, the purpose here is to propose a number of subjects for study which are felt to deserve priority at the international level.

The new networks are altering the information supply and are instrumental in recasting traditional communication systems. Studies are needed to identify their strategies, unravel their complexity and show how they are intertwined. Questions are being asked about the competition and complementarity between the different communication networks, their interconnection and their effects on the international interpenetration of economies. Research also needs to be undertaken on the deterritorialization of information and the impact of this on national sovereignty. Moreover, direct broadcasting satellites are spreading and warrant special attention.

The new technologies are instrumental in recasting the institutional and legal frameworks regulating the communication sector. It has to be asked what effects the evolution of telecommunications and audio-visual organizations in the Western countries is having on communication systems in the other regions of the world, and the impact of these on the principles of co-operation and the tariffs applicable to international exchanges of information. There are still likewise problems to be solved regarding the definition and enforcement of the legal frameworks for the protection of audio-visual and informatics products. Legal studies are also needed on the international regulation of transfrontier flows.

Mergers of communication and advertising groups, and their national, regional and international strategies offer a vast field of study, as do trends in the way audio-visual production is financed. The economic aspect of communication is subject to far-reaching upheavals and requires fresh analysis, especially regarding the market value of information.

Transfers of the new technologies calls for research and development work covering the definition of needs, possible applications, cost-benefit evaluation and the economic and social effects of projects. Priority should be given to the informatics sector and, in particular, research should be undertaken on the structure and component parts of the software industry existing in different developing regions. Special attention must also be given to the nature of the poor countries' participation in transfrontier data flows and the impact which such flows have on the development process.

The teaching applications of informatics give rise to a whole series of questions on methods and means used in that technology and on its cost and effectiveness. Comparative research is essential for measuring the influence of informatics on cognitive processes in different socio-cultural and language environments. Longer-range studies are also needed on the complementarity of informatics and the audio-visual media in teaching methods.

The cultural dimensions of the new technologies make it important to update the data on regional and international audio-visual flows, taking into account direct satellite reception and video. Very little is known about people's exposure to the new media in the developing regions and both quantitative and qualitative audience surveys are needed in order to determine consumption patterns and the effects of these on people's values, norms and ways of life. Research also has to look into the adaptation of endogenous cultures to the new media and the forms of cultural creativity and permanency of the societies involved. In addition, the evolution of endogenous cultures produced by the interaction of the values of tradition and modernity calls for comparative ethnographic studies.

The processes involved in the dissemination of the new communication technologies should prompt studies on the ways individuals and groups in different societies have access to them and make use of them. The introduction of the new interactive information, transaction and interpersonal communication services into the home opens the way for ethnographic research on changes in behaviour patterns, ways of life and social relations. The widespread use of information technologies in everyday life also raises the question of the impact that technical rationality has on ways of doing things and on cognitive structures, as well as its effects on social values and representations. Case studies should also be made of the local dimensions of the new technologies and of community and participatory projects in which they are involved.

This set of subjects for study forms a basic framework which, in view of the scale of the questions to be answered, can merely serve as a guide. Since the new technologies have intersectoral effects, multidisciplinary research has to be encouraged. In addition, in a number of cases, the complementarity of quantitative and qualitative methodologies can make it possible to gain a clearer understanding of the different dimensions of the processes of changes and their complexity.

National and regional communication research institutes now have to redefine their research policies, and studies on the new technologies are often becoming a priority. Regional and international organizations also have an important role to play in stimulating and funding research, and indeed in co-ordinating it. In view of the specific terms of reference, Unesco can provide the research effort with special support in the following areas:

The exchange and circulation of information, by setting up an intersectoral data base on the applications of the new technologies in different regions of the world, in particular in the fields of education, science and culture. In fact, the automation of information can make it

possible to capitalize on the research findings, so that they can contribute to decision-making and planning and to the implementation of communication projects;

Documentation by strengthening and extending the International Network of Documentation Centres on Communication Research and Policies (Comnet);

Comparative research on the applications, uses and effects of the new technologies in various communication sectors, by laying stress on the intercultural dimension;

The organization of co-operative networks between researchers belonging to the same region or several regions;

Research in the developing regions, by providing support for local research centres, in order to obtain a clearer picture of the social dynamics and the repercussions of the new technologies on communication systems and endogenous cultures.

Communication is now entering a new era. The technological explosion is producing a wide variety of effects in all the regions of the world. In the face of these upheavals, research is a unique instrument which, if used to its full capacity, can contribute to ensuring that individual countries and the international community can exercise control over the challenges to society presented by the new context in which communication is now situated.

Bibliography

This bibliography on the new communication technologies is in two parts: one covering the studies carried out by Unesco on the subject and the other a more general bibliography.

The general bibliography was compiled with due regard to three main criteria: the inclusion of references to the main new technologies, the widest possible international coverage, and subject entries on the effects of the new technologies in the economic, legal, educational, social and cultural fields.

In addition, a special effort has been made to cover recent publications having appeared since 1980. These have been taken from the literature of a number of countries, and are accordingly accessible in different languages.

In any event, this bibliograpy does not purport to be exhaustive. It does not quote the voluminous 'grey material' or the very many articles that have been published in the specialized press and scientific reviews. However, an exception has been made for a number of reference works primarily covering the development countries, to which few publications have been devoted.

A large number of reports on conferences, seminars and symposia held under the auspices of regional and international institutions have been consulted but, owing to space restrictions, it has not been possible to cite this abundant documentation.

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